

LLOYD MINE  
ANNUAL REPORT  
YEAR 1938

8. COST OF OPERATING (Cont.)

5. Stopping (Cont.)

	<u>1938</u>		<u>1937</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
Payroll Labor	71,673.31	.286	157,765.43	.308
Cliffs Shaft Labor	91.41	.001	372.60	.001
General Shops Labor	874.08	.003	1,115.06	.002
Shops, Labor etc.	2,081.83	.008	3,178.80	.006
	<u>74,720.63</u>	<u>.298</u>	<u>162,431.89</u>	<u>.317</u>
 <b>GRAND TOTAL</b>	 99,742.90	 .398	 209,183.51	 .408
 Production, Tons Stopped	 250,724		 512,020	
Avg. Miners Rate for stopping		7.22		7.20
Avg. Tons per Man Stopping		29.76		25.74

6. Timbering

The usual maintenance expense applied on the reduced tonnage caused an increase in the cost of timbering. The larger diameter stull timber used in the 6th Level ore drift also added to the increase of from .223 per ton in 1937 to .251 in 1938.

7. Tramming

The increased stopping efficiency also effected a small reduction in this cost. The electric power charge was reduced only from \$4800 to \$3700 but the labor charge was less than half because of the large average number of tons trammed per 8 hour shift. This resulted in the small saving of .108 per ton in 1938 compared to .110 in 1937.

8. Ventilation

The extension of the 1st Level ventilation intake raise in 1937 increased the charge that year. The \$592.29 expense in 1938 included only the fuel proportion, underground fan repairs, and purchase of Ventube.

9. Pumping

The total pumping expense was reduced in 1938 in spite of an increase in the amount of water handled. The extension of the surface cave in November 1937 is believed responsible for the increase from 137.6 gal. per minute to an average of 159.7 because of the larger drainage area over the ore-body. The growing proportion of the water issuing on the 5th Level was pumped to the 4th Level at the Lloyd shaft by the automatic relay pump installed early in the year.

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8. COST OF OPERATING (Cont.)

9. Pumping (Cont.)

This water drains to the 4th Level sump at the Morris shaft from where it is pumped to surface with the remainder by the Inland Steel Co.

The charges were again allocated by the proportions determined from daily weir readings, the totaling checked at the end of the month by the pump calculations. The Morris Mine water also increased for the third successive year and the total pumping expense for both mines in 1938 passed the \$50,000 mark. The Lloyd Mine proportion was just under 22% and the 1938 cost was less than 1937 because of this reduction and the elimination of the \$1561.09 proportion of the cost of a new motor for one of the 4th Level pumps in 1937.

The comparative figures for the past 5 years are shown in the following table:

	<u>Inland Steel</u>			<u>C.C.I.Co.</u>		
	<u>Amount</u>	<u>Per Cent</u>	<u>Avg. Gal. per Min.</u>	<u>Amount</u>	<u>Per Cent</u>	<u>Avg. per Min.</u>
Total - 1938	39,606.07	78.09	568.2	11,113.14	21.91	159.7
1937	30,636.14	69.05	360.1	13,751.40	30.95	137.6
1936	14,887.49	61.20	208.	9,446.76	38.80	137.
1935	8,864.80	51.40		8,384.18	48.60	
1934	7,449.56	44.27		9,578.76	55.73	

10. Compressors and Air Pipes

The cost per ton, and per 1000 cu. ft. compressed, was higher principally because of the increased cost of electric power. The cost of extending and maintaining air lines was directly in proportion to the tonnage mined each year, as shown in the following table:

	<u>1938</u>	<u>1937</u>
Operating Compressors	13,082.05	19,284.47
Air Pipes	3,287.52	6,638.90
Total	16,369.57	25,923.37
Cost per 1000 Cu. Ft.	.056	.038
Cost per Ton	.060	.048

12. Underground Superintendence

This expense did not decline in proportion to the product so the cost per ton was .01 higher in 1938.

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8. COST OF  
OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

14, 15, 16, and 17. Maintenance of Drilling, Loading, Tramping and Pumping Equipment

The maintenance and repairs on each of these equipment classifications included no extraordinary items in 1938. Because of this the amounts and cost per ton were well below the like figures in 1937.

18, 23. Hoisting and Maintenance Hoisting Equipment

The maintenance expense was about in line with production, but the operating charge was higher because of the labor and electric power costs which could not be reduced in the same proportion. The following table lists the detail of these accounts:

	<u>1938</u>	<u>1937</u>
Maintenance	3,913.66	7,034.21
<u>Operating</u>		
<u>Labor:</u>		
Engineers	6,188.61	9,869.61
Other Labor	39.39	30.91
Total Labor	6,228.00	9,900.52
<u>Supplies</u>		
Oil Waste & Packing	74.33	97.38
Tools & Misc. Supplies	119.77	230.07
Electric Power	11,196.04	15,649.28
Heating Expense	521.74	447.05
Total Supplies	11,911.88	16,423.78
Total Operating Expense	18,139.88	26,324.30
Total Opt. & Maintenance	22,053.54	33,358.51
Tons Rock & Ore Hoisted	286,864	559,581
Average Depth Hoisted	900	890

19. Stocking Ore

Approximately the same amount of ore was stocked in each of the years 1937 and 1938. This expense applied on the reduced production in 1938 increased the total cost from .014. to .033.

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8. COST OF  
OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

22. General Surface Expense

The expense of taking care of the premises and the proportion of the policemen's time were almost as much as in 1937. The cost per ton therefore was .021 in 1938 compared to .014 in 1937.

24. Shaft Maintenance

The replacement of the upper level bearers in 1937 had increased the cost that year. The 1938 cost of .004 was nearer the normal.

26. Docks, Trestles and Pockets

The repairing of the permanent trestles accounted for a small increase in the amount in 1938. This brought the cost per ton to .021 compared to .011 in 1937.

27. Mine Buildings

This cost was held to a minimum in 1938 so the cost per ton dropped from .007 to .002.

28. Insurance

A group insurance credit of \$1443.41 in December caused the large decrease in the total amount. The property and Catastrophe expenses were about the same in both years.

29. Mining Engineering

There was little difference in the total expense for both years, so the cost per ton increased from .004 to .009 in 1938.

30. Mechanical and Electrical Engineering

The same is true of this account, the cost per ton increasing from .003 to .006.

31. Grading and Analysis

The reduced number of samples on shipments, and on high grade or known underground working places, lowered the cost per ton from .024, to .022.

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8. COST OF  
OPERATING (Cont.)

b. Detailed Cost of Comparison (Cont.)

32. Personal Injury

The improved 1938 accident record effected a welcome reduction in the doctor and compensation payments from \$9295.31 in 1937 to \$4925.63. The proportion of the hospital loss, however, declined only \$4511.00 to \$4077.76.

35. Local and General Welfare

The district welfare cost, including the North Lake Club loss, increased from \$2434.74 to \$3270.09. This increase applied on the reduced 1938 production brought the cost per ton to .024 compared to .011 in 1937. The holding of school classes in the club house after the school building was destroyed by fire in March also increased the heating and maintenance expense of the club house.

38. Social Security Taxes

The reduced amount was due to the lower average number of employees in 1938. The decrease was not in proportion to the difference in production so the cost per ton was .038 compared to .025 in 1937.

40. Taxes

The increase in this one account of .139 per ton was more than the combined increase of the surface and underground costs of .105. In other words, taxes alone represented by far the largest single increase in the 1938 total cost of 1.719 which compared with 1.412 in 1937. Three factors entered into this change: first, the increased mine valuation; second, the increased rate because the debt service on the new North Lake School; and third, the smaller mine production. The comparison in detail follows later in this report under general heading number 10.

9. EXPLORATION AND  
FUTURE EXPLORATIONS

There was no exploratory work except ordinary development within or close to the limits of the orebody, and none is contemplated.

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10. TAXES

The following figures show the taxes paid in Ishpeming Township for the past two years by the Mining Department on the Lloyd Mine, on lots in West Ishpeming, and on property in the North Lake Location.

	1938		1937	
	Valuation	Taxes	Valuation	Taxes
<u>Lloyd &amp; Section 6</u>				
N $\frac{1}{2}$ S $\frac{1}{2}$ of Sec.6-47-27, 161.67 A.				
SW of NW $\frac{1}{4}$ of Sec.6,47-27, 40 A.	2,135,000	43,635.55	1,335,000	21,027.46
Personal, Supplies and Equip.	465,000	9,504.41	680,000	10,699.96
S $\frac{1}{2}$ of NE $\frac{1}{4}$ of Sec.6, 47-26, 80 A.	320	6.52	320	5.04
SE $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec.6, 47-26, 40A.	575	11.74	575	9.06
SE $\frac{1}{4}$ of NW of Sec.6, 47-26, Except R.ofW.	350	7.16		
S $\frac{1}{2}$ of SW $\frac{1}{4}$ of Sec.6, 47-26	700	14.32	1,400	
SW $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 6, 47-26	3.50	7.16		
Total	2,602,295	53,186.86	2,017,295	31,741.52
Collection Fees		531.87		317.40
Total		53,718.73		32,058.92
Personal Ore, Morris Mine		163.96		100.77
Total Lloyd Mine		53,882.69		32,159.69
Lots in West Ishpeming	25	.52	385	2.66
Accounts Reveivable Negaunee Land Dept.				3.50
<u>North Lake Dwellings</u>				
Houses on Sec. 6, The CCI Co.	40,500	827.81	40,500	637.56
Collection Fees		8.28		6.37
Total Dwellings		836.09		643.93
Total Ishpeming Township	2,642,820	54,555.34	2,058,180	32,709.01
Rate		2.05		1.573

The valuation of the Lloyd Mine 1936 was \$1,650,895. This was increased in 2 years to \$2,602,295, and this alone would have meant a considerable increase had the rate remained the same. The building of the North Lake School to replace the one destroyed by fire added 5 mills to the rate, and this combination brought the Lloyd Mine taxes up to \$53,882.69 in 1938 compared to \$32,159.69 in 1937.

The comparative tax payments based on the varying production and shipment cycles are interesting. The following table shows the figures for the last three years:

	1938	1937	1936
Tax paid per ton produced \$	.198	.059	.079
Tax paid per ton shipped	.479	.0497	.0815

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11. ACCIDENTS AND  
PERSONAL INJURY

There were 5 lost time accidents in 1938 compared to 8 in 1937. The frequency rate in 1938, because of the reduced number of working days, was slightly higher at .122 per thousand days compared to .105 in 1937. It is again a pleasure to be able to report a drop in the severity rate from 8.00 days lost per thousand worked in 1937 to 5.85 in 1938. This represents a reduction of more than half from the 12.40 figure of 1936, and it is earnestly hoped that this trend can be continued through 1939.

The last lost time accident occurred at the mine on April 14th, so the remaining  $8\frac{1}{2}$  months established an interval which has not been equalled for some time. With this thought in mind the active and participating interest of every man has been directed toward continuing the record.

Three of the 1938 accidents resulted in leg injuries, one was an eye injury and the fifth a finger injury. The detailed list follows:

Accident #793 - Lawrence Roberto, Timber hoister.  
Injured Jan. 10th. Tripped and injured left knee. Time lost Jan 10th to Jan. 24th.

Accident #794 - Charles Pascoe, Cage rider. Injured March 9th. Tripped on guard rail while pulling load of timber from cage and factured lower end of right fibula. Time lost - March 9th to June 21st.

Accident #795 - Emil Verlin, Timber Hoister, injured April 14th. Right hand caught in wire rope while hoisting timber. Amputation distal portion distal phalynx right thumb. Time lost April 14th to Aug. 8th.

Accident #796 - Walter Alto, No. 9 contract, injured March 29th. Drop of dirty water fell in right eye causing corneal ulcer. Time lost March 29th to April 18th.

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11. ACCIDENTS AND  
PERSONAL INJURY

Accident #797 - Archie Pozza - No. 6 contract injured April 14th. Stepped between stage planks, injury resulting in severe contusion of left knee. Time lost April 14th to May 12th.

12. NEW CONSTRUCTION AND  
PROPOSED NEW CONSTRUCTION

The many additions and improvements to the surface and underground plants in 1937 seemingly left little to do in 1938. The most important construction was the new stockpile grounds graded and prepared under contract with Lindberg Bros. at a cost of \$375.48. This work was done in June and has already been described under the "Surface" heading. The trestle of 21 bents erected here in October may also be classified as new construction. Several other minor jobs such as the fitting of the interior of the storage building south of the shaft with bins and lockers, and the addition of a sectional storm shed to the north entrance of the dry house, were completed in 1938.

Several construction jobs are planned for 1939. The most important of these is the replacement of the present wood shanty at the north entrance to the downcast cage road. To place this structure in keeping with the rest of the surface buildings and eliminate the fire hazard, a heated steel and concrete building, and steel casing between the cage and skip roads to the landing floor, are proposed. A second necessary change in the enlargement of the cooling pond on the west side of the engine house to provide adequate cooling capacity when both compressors are running. The purchase of a 5' diameter fan, and construction of a permanent fan station and reversing door arrangement underground, was postponed in 1938 because of general conditions, but it is hoped this addition may be accomplished in 1939.

13. EQUIPMENT AND  
PROPOSED EQUIPMENT

The most expensive equipment purchase was the small compressor motor which was installed in January.



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13. EQUIPMENT AND  
PROPOSED EQUIPMENT (Cont.)

This 150 H.P. motor replaced a 100 H. P. motor which burned out last December. This addition was covered by E&A #793 in the amount of \$1224.42, and the final cost, including installation, was \$1312.43. No hoisting ropes were bought in 1938, but 2 top tram 5/8" ropes were necessary. Twelve floodlights for improved illumination in the underground working places were purchased after a trial had demonstrated their suitability. A Moyno sludge pump for cleaning ditches and sumps proved its worth in the quick cleaning of the 5th Level sump, and 2 old style Sullivan electric hoists were repaired and transferred from the Negaunee Mine to be used as timber hoists instead of buying utility air hoists at \$450.00 each. The complete equipment list follows:

2100'	5/8", Plow Steel, Top Tram Cable	\$ 336.00
2640'	5/8", Cast Steel, Top Tram Cable	304.55
200'	10 Cond. Signal Cable for shaft extension to 7th Lev.	83.36
186'	8 Cond. Signal " " " " " " " "	99.51
12	No. 197576 Contact Levers for small compressor motor controller	187.51
1	R-86 Controller for haulage motor	97.77
1	10" - 23Ft. Belt for Crusher	59.04
12	No. A-45-G3 Floodlights for underground contracts	52.80
2	10 KVA Transformers for 5th Level Relay Pump	238.30
1	Bevel Wheel for Crusher	286.40
1	Set 8Ft. Steel Sheave Liners for Counterweight Head Sheave	85.00
1	No. 4 Moyno Sludge Pump, Complete with 2 HP, DC Motor	300.50
2	6 1/2 H.P. Sullivan Hoists, Transferred from Negaunee Mine Company	200.00
6	Rubber lined Idler Sheaves for Skip Rope	258.78

In addition to the above, 5 timber trucks and 1 saddle-back top tram car were on order, and in the process of construction, at the central shops at the end of the year.

14. MAINTENANCE  
AND REPAIRS

The installation of the 150 H.P. small compressor motor in January placed this unit in shape for satisfactory operation during the rest of the year. The crosshead brasses were renewed in the larger Sullivan compressor in December, and it is worthy of note that this machine has given steady and efficient service over a number of years with virtually no repairs.

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14. MAINTENANCE  
AND REPAIRS (Cont.)

The cage hoist was placed in perfect balance in November, and the counterweight rope was replaced in October by a second hand rope from the Athens Mine. An addition which effects a considerable saving in the current cost was a buzzer signal connected with the demand meter to aid the hoisting engineers in keeping the maximum within reasonable limits. The water supply pump cable was grounded by lightning near the switch stand in the engine house in August but permanent repairs was made without delay. The burning out of the skip hoist motor cable on June 22nd however caused a 5 hour delay and necessitated the replacement of 40' of armored cable. The permanent wood trestles on both sides of the shafthouse were repaired in July by inserting new caps, legs, and some new stringers between the old bents. These supporting bents were then blocked up to take the strain off the older partially rotted sections of the permanent trestle.

Shaft repairs consisted mainly of replacement of worn skip runners. The heavy production schedule in 1937 left little time for extensive repairs, and the wear was faster than the normal rate. In July the runners in the 3 compartments were gauged and the worn sections noted. During the next several months these sections were fitted with new runners, much of the work being above the Second Level where the old runners had been subject to ice conditions for several winters before the shaft heating unit had been installed. The total replacement was 1040' of  $5\frac{1}{2}$ " x  $7\frac{1}{2}$ " runners in 16' lengths, and all but a few feet of this was in the skip roads. Oak wearing strips were also nailed on runners with rounded edges, and a number of dividers which had been cut away by spillage were replaced in the lower portion of the shaft.

The reduced working schedule had little effect on the maintenance of underground openings, for the physical structure of the Lloyd orebody fortunately is such that there is little crushing or swelling, and little necessity therefore, of frequent retimbering of raises and drifts. The replacement of rotted timber is also at a slower rate than many other mines because the lower temperature of the shallower workings is an aid in retarding timber decay.

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14. MAINTENANCE  
AND REPAIRS (Cont.)

Beside the usual small amount of main level and raise timber repair work, there was in 1938 the additional bracing of the 4th Level storage pocket supports, and the relining of the timber in the 4th Level rock drift along the north side of the orebody. The drag or pull from mining operations below the south side of this drift split the slate seams and placed weight on the old timber sets. Relineing of the drift with new timber was underway during the latter part of the year, but in December a breakdown of 4 sets occurred which cut off production from this level for 4 days. Mining operations proceeded above the level while repairs were being made, the ore being held in the long raises, so there was no production delay. The relining of a number of the 5th Level raise ore compartments with hardwood planks was also underway at the end of the year, to prevent the wearing away of the cribbing.

b. Location

1. General Maintenance

The following table lists the costs of maintaining the North Lake location in 1938 and a comparison of the total with former years:

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
Prop. of Policemen's Time	1,917.33		1,917.33
Cleaning	782.96	54.28	837.24
Repairing Water Mains	430.67	139.97	570.64
Water		1403.97	1,403.97
Removing Snow & Ice	73.06	5.82	78.88
Sewers & Cess Pools	295.81	68.41	364.22
Fencing	75.01	24.75	99.76
Total	3,574.84	1697.20	5,272.04
Year 1937			6,109.82
1936			5,952.21
1935			3,248.22
1934			2,600.78

The cost of pumping water and repairing water mains was higher than in 1937. The higher average power rate, and reduced collections from employees accounted for the increase in the water supply cost.

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14. MAINTENANCE  
AND REPAIRS (Cont.)

b. Location

1. General Maintenance (Cont.)

The 3/4" service pipes to the houses in the southwest corner of the location were about rusted away, and the ditching and replacement of these pipes with 1" mains in May and June brought about the large increase in the water main repairs. The cess pool cleaning expense was also considerably higher, for no new pools have been dug during the past several years in anticipation that the necessary sewer system will soon be installed in the location. Taking into account these necessary expenditures, the total of \$5272.04 compared favorably with the \$6109.82 maintenance cost in 1937.

2. Rented Buildings

Except for roof repairs the work on rented buildings was held to a minimum. The \$1582.44 expense of placing of sheet metal strips above the eaves on 18 additional houses, and the re-cementing of roof shingles on 32 double houses was justified as a protection for interior decorating done in 1937 and former years. The sheet metal strips have been very successful in preventing ice from lifting the asbestos shingles at the junction of the sidewalls and roof and the consequent leaks to the interiors of the houses in the Spring. The painting and carpenter work was a little over \$2000 compared to the unusually large expense of \$26,866.61 in 1937 in completing the outside painting of all the houses.

The total expenditure and comparison with 1937 was as follows:

		<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
1938	\$	1,252.80	3,668.32	4,921.12
1937		19,245.31	10,025.94	29,271.25
Decrease				24,350.13

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14. MAINTENANCE  
AND REPAIRS (Cont.)

b. Location

2. Rented Buildings (Cont.)

The 1938 expense was divided approximately as follows:

Painting	\$	632.27
Carpenters		1,437.09
Roof Repairs		1,582.44
Plumbing		350.00
Cleaning Chimneys		151.50
Wiring		92.54
Miscellaneous		675.28
Total	\$	<u>4,921.12</u>

15. POWER

The consumption of electric power in 1938 decreased nearly in proportion to the drop in production. The cost, however, was only 26% below that of last year because the single shift operation from June to October reduced the load factor below 33%. The usual maximum demand based on this load factor raised the power cost to over 2¢ per kilowatt hour during this period, and the average for the year was 1.741 ¢ compared to 1.567 in 1937. There were no serious delays from power interruptions during either of these years, the storm in January 1938 preventing the men from reaching the mine during the interval the power was off.

The comparative consumption and cost figures follow:

	<u>K.W.H.</u>	<u>Cost</u>
1938	1,762,000	\$ 30,677.20
1937	<u>3,035,200</u>	<u>41,504.24</u>
Decrease	1,273,200	10,827.04
Decrease	41.9%	26.1%

16. WATER SUPPLY

The water supply for the Lloyd Mine and North Lake Location consists of a pump on the 2nd Level south of the Lloyd Shaft piped to a concrete reservoir 50' in Diameter and 20' high on the hill west of Section Six shaft.

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16. WATER SUPPLY (Cont.)

This part of the system gave trouble-free operation in 1938, but the replacement of some of the 3/4" service mains in the location at a cost of \$570.64 has been described under "Location Maintenance."

The start of mining operations in 1939 above the west end of the new 6th Level will be only a short distance south of the reservoir tank. The pipe from the tank to the location will also be undermined, but it is expected that some years will elapse before the surface cave extends far enough west to affect the system. The rate of extension in the meantime will indicate the time when the pipe should be re-routed or the tank location changed.

17. CONDITIONS OF PREMISES

The changes that have been made on surface at the mine during the past 3 years included landscaping of the central area, construction of roads and parking grounds, and the replacement of all frame structures with steel and concrete buildings. The healthy growth of the flowers, shrubbery and trees during the summer, and the appearance of the lawn on the slope in front of the main building, were a source of pride and satisfaction to all who had a part in the improvement. The comments of visitors, and of the employees themselves, were a good indication that this policy of the Company is extremely worthwhile, and that the Lloyd Mine now measures up to the high standard of the other mines in the Ishpeming and Negaunee districts.

Very little work was needed to maintain the fine appearance of the location buildings for the painting of all the houses was completed in 1937. The continued 100% occupancy, and long waiting list, is a tribute to their condition. A number of repairs were made to the clubhouse interior in December which placed this building in better shape, and weather stripping of the windows is expected to reduce the heating cost considerably.

The one great need in the location is the installation of a sanitary sewer system to replace the present outhouse and cesspool combination, and it is hoped that this improvement can soon be started.

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18. NATIONALITY OF  
EMPLOYEES

	<u>American</u> <u>Born</u>	<u>Foreign</u> <u>Born</u>	<u>Total</u>	<u>Per</u> <u>Cent</u>
Finnish	36	41	77	38
Italians	8	29	37	18
French	32	2	34	17
English	18	6	24	12
Swedish	16	5	21	10
Norwegians	4		4	2
Austrian	1	1	2	1
German	1		1	1
Belgian	1		1	1
Total	117	84	201	100%

The total number of employees in 1937 was 275. The reduction of the working force in June made little change in the relative proportions except in the case of employees born in this country. The laying off of the younger single men reduced the percentage of American born from 66% in 1937 to 58% in 1938.

MORRIS MINE  
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1. GENERAL

Production in 1938 was on a par with 1935, averaging only about 20,000 tons per month. For the first four months the schedule was 5 days per week. During the next two months little ore was produced while the hoisting engines were being rebuilt. For the last six months a four-day per week operation was maintained. Production was also curtailed by moving miners from the subs to the shaft which was completed to the new 9th level.

On the surface pumping continued throughout most of the year from Deep Wells #1 and #2. There were some interruptions due to the January blizzard and in February both pumps had to be repaired. There were also further delays due to electrical storms burning out switches.

Underground all three dams on the main levels were completed. The 8th level dam was really finished in 1937 but the one on the 7th and the one on the 6th together with those we built on the upper levels now make it possible to isolate the shaft from all the working places. Presumably in time a dam will also be built on the new 9th level.

One of the most disturbing developments underground was the discovery of additional high sulphur ore in the "B" deposit and the Northwest corner of the 8th level. Two years ago a high sulphur area was found in the Southeast corner of the Main Deposit.

A new centrifugal pump was installed in the 8th level pump-house and a new 8" water discharge line now runs from the 8th level to surface.

A change was made in the underground foremen, a new Mining Captain - Walter Wickstrom - replacing Gust Bjerne. The latter is now Night Captain.

The ore estimate shows an increase in tonnage of 61,602 tons to which must be added the year's production of 240,324 tons to determine the amount of new ore developed. The tonnage includes 69,040 tons of high sulphur ore.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES

a. Production

	<u>Grade</u>	<u>Tons</u>
Morris Standard		198,283
" Siliceous		<u>42,041</u>
Total		240,324

The division between fee and leased lands was as follows:

	<u>Leased</u>	<u>Fee</u>	<u>Total</u>
	<u>Lands</u>	<u>Lands</u>	<u>Tons</u>
Morris Standard	<u>137,077</u>	<u>61,206</u>	198,283
" Siliceous	32,143	9,898	<u>42,041</u>
Total	169,220	71,104	240,324
Percentage of Total	70.4	29.6	100.00



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Tonnage and percentage of product from fee and leased lands for all the years the Inland Company has operated this property follow:

Year	Leased Lands		Fee Lands	
	Tons	% of Total	Tons	% of Total
1938	169,220	70.4	71,104	29.6
1937	261,468	61.4	164,490	38.6
1936	180,647	51.9	166,752	48.1
1935	187,679	76.5	57,781	23.5
1934	129,284	74.6	43,985	25.4
1933	103,487	82.0	22,709	18.0
Grand Tot.	1,031,785	66.2	526,821	33.8

The product from the mine divided between Standard and Siliceous ore for the same years follows:

Year	Standard Ore		Siliceous Ore		Total
	Tons	% of Total	Tons	% of Total	
1938	198,283	82.5	42,041	17.5	240,324
1937	316,353	74.4	109,605	25.6	425,958
1936	289,421	83.4	57,978	16.6	347,399
1935	202,296	82.5	43,164	17.5	245,460
1934	125,634	72.8	47,635	27.2	173,269
1933	105,441	83.6	20,755	16.4	126,196
Total	1,237,428	79.4	321,178	20.6	1,558,606

b. Shipments

Ore shipped from stockpile and pockets for 1938 were, viz:

Grade	Pocket	Stockpile	Total
	Tons	Tons	Tons
Morris Standard	68,972	130,485	199,457
" Siliceous	21,812	18,650	40,462
Total	90,784	149,135	239,919

Shipments for the past six years were as follows:

Year	Standard Ore	Siliceous Ore	Total Ore
1938	199,457 tons	40,462 tons	239,919 tons
1937	250,468 "	88,578 "	339,046 "
1936	236,512 "	64,373 "	300,885 "
1935	181,233 "	36,624 "	217,857 "
1934	110,956 "	45,565 "	156,521 "
1933	63,255 "	13,300 "	76,555 "
Total	1,041,881 "	288,902 "	1,330,783 "

c. Ore in Stock

On December 31, 1938, stockpile balances showed these figures:

Morris Standard Ore	198,632 tons
" Siliceous "	29,147 "
Total	227,779 "

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The amount in stock is practically the same as it was a year ago.

Stockpile balances as of Dec. 31, 1938	-	227,779	tons
" " " "	1937	-	227,374 "
" " " "	1936	-	140,459 "
" " " "	1935	-	93,993 "
" " " "	1934	-	66,389 "
" " " "	1933	-	49,641 "

e. Production by Months

<u>Month</u>	<u>Shifts Operated</u>	<u>Morris Standard</u>	<u>Morris Siliceous</u>	<u>Total Production</u>
January	18.5	19,226	3,772	22,998
February	20	23,177	2,871	26,048
March	21	25,933	2,917	28,850
April	21	23,966	4,204	28,170
May	8	8,744	1,493	10,237
June	4	3,085	799	3,884
July	19	17,507	4,313	21,820
August	19	19,278	4,419	23,697
September	17	13,812	2,975	16,787
October	17	12,060	7,132	19,192
November	18	13,613	5,002	18,615
December	17	17,882	2,144	20,026
Total	199.5	198,283	42,041	240,324

The average daily product by months and tons per man per day follows. The latter figure, however, is conjective.

<u>Month</u>	<u>Average Daily Product</u>	<u>Total Tons Per Man Per Day</u>	<u>No. of Men Employed</u>
January	1,243	5.44	222
February	1,303	6.05	215
March	1,374	6.32	218
April	1,341	6.24	215
May	1,279	5.92	216
June	971	4.52	215
July	1,148	5.92	185
August	1,248	6.39	185
September	987	5.25	188
October	1,129	5.68	193
November	1,034	4.82	207
December	1,178	4.83	210
Yearly Average	1,204	5.75	206

The tons per man per day are based on a total of 42,219 man shifts worked for the year 1938. The County Mine Inspector's report shows 45,095 man shifts worked for the period September 1, 1937, to September 1, 1938. That report also gives the number of operating days for that period as 208 which makes 216 shifts worked for each operating day. Our monthly data compiled in this report gives an average of 212 shifts for each operating day. The comparative data indicates that possibly we have estimated the number of shifts worked each month at too low a figure so that the tons per man per day for the year might be a little too high. However, the error, if any, is very small.

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f. Delays

There were no serious delays reported to us during the year resulting from breakdown of equipment or accidents. However, there were minor delays due to power interruption and the mine was closed as were all other properties on January 25, 26, and 27th, during the storm. No ore was hoisted for six weeks in May and June while the hoists were being rebuilt.

3. ANALYSIS

Following are detailed and composite results on shipments of Morris Standard Ore:

<u>Month</u>	<u>Tons</u>	<u>Iron Dried</u>	<u>Moisture</u>	<u>Iron Natural</u>
January	-			
February	1,142	59.35	10.01	53.41
March	1,409	59.45	10.34	53.31
April	-			
May	8,033	59.08	9.19	53.61
June	8,700	58.66	10.00	52.79
July	30,951	58.22	10.48	52.12
August	37,821	58.11	10.65	51.92
September	30,606	58.33	10.48	52.26
October	67,590	58.50	10.34	52.45
November	11,061	58.73	10.46	52.59
December	2,146	58.10	10.58	51.95
Total	199,457			

Average Analysis of Morris Standard shipments were:

Iron Natural	52.33
Phos.	.051
Silica	9.31
Moisture	10.39

Siliceous Shipments averages follow:

<u>Month</u>	<u>Tons</u>	<u>Iron Dried</u>	<u>Moisture</u>	<u>Iron Natural</u>
January	-			
February	53	50.68	9.00	46.12
March	-			
April	-			
May	2,472	50.12	8.90	45.66
June	1,927	51.81	9.17	47.06
July	3,920	52.09	9.68	47.05
August	4,269	51.27	10.09	46.10
September	5,458	52.13	9.78	47.03
October	18,974	51.64	9.81	46.57
November	3,194	50.95	9.82	45.94
December	195	51.23	9.90	46.16
Total	40,462			

Average Analysis of Silica shipments were:

Iron Natural	46.52
Phos.	.046
Silica	17.89
Moisture	9.78

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The accumulated analysis of the ore as stocked follows:

<u>Month</u>	<u>Tons</u>	<u>Morris Standard</u>		
		<u>Iron Dried</u>	<u>Phos.</u>	<u>Moisture</u>
January	319,032	58.91	.063	10.55
February	240,467	58.93	.062	10.55
March	265,591	58.88	.061	10.55
April	289,557	58.86	.060	10.55
May	-			
June	-			
July	271,210	58.87	.060	10.55
August	252,667	58.87	.060	10.55
September	235,873	58.87	.060	10.55
October	180,344	58.87	.060	10.55
November	182,896	58.40	.059	10.27
December	198,632	58.43	.059	10.27
Natural Average		52.43	.053	10.27

<u>Morris Siliceous</u>				
January	31,340	51.05	.051	9.80
February	34,159	51.04	.050	9.80
March	37,076	51.01	.050	9.80
April	41,280	50.98	.050	9.80
May	-			
June	-			
July	39,566	50.94	.049	9.80
August	39,716	50.94	.049	9.80
September	37,233	50.94	.049	9.80
October	25,390	50.94	.049	9.80
November	27,198	51.35	.052	9.71
December	29,147	51.38	.052	9.71
Natural Average		46.39	.047	9.71

Analysis of Ore Reserves

Note: All Natural Analysis.

<u>Grade</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Morris Standard	52.47	.060	8.82	.45	2.30	.73	.26	.012	2.58	10.27
" High Sulph.	52.75	.106	7.20	.39	2.28	-	-	.458	-	10.27

Analysis of Ore in Stockpile

Note: All Natural Analysis.

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Moisture</u>
Morris Standard	52.43	.053	9.27	.41	1.95	10.27
" Siliceous	46.39	.047	17.84	.33	2.27	9.71

Analysis of Shipments

Note: All Natural Analysis

<u>Grade</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Morris Standard	52.33	.051	9.31	.40	1.96	.87	.38	.013	1.70	10.39
" Siliceous	46.52	.046	17.89	.33	2.31	-	-	-	-	9.78

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4. ESTIMATE OF  
ORE RESERVES

	<u>Ore Reserves as</u> <u>of Dec.31, 1938</u>	<u>Ore Reserves as</u> <u>of Dec.31, 1937</u>	<u>Difference</u>
Chase Lease #26	26,140 tons	26,140 tons	None
" " 25	33,273 "	33,273 "	"
" " 24	142,183 "	86,634 "	+ 55,549 tons
" " 9	1,514,949 "	1,539,461 "	- 24,512 "
C.C.I.Co. Lands	532,847 "	571,322 "	- 38,475 "
Total	<u>2,249,392 "</u>	<u>2,256,830 "</u>	<u>- 7,438 "</u>
 <u>High Sulphur Ore</u>			
Chase Lease # 9	13,893 "		
" " 24	55,147 "		
Total	<u>69,040 "</u>		
GRAND TOTAL ORE RESERVES	2,318,432 "		
1938 Production of Standard Ore	198,283 "		
	<u>2,516,715 "</u>		
1937 Estimate	2,256,830 "		
Net Gain for 1938	<u>259,885 "</u>		

Detail of Ore Estimate

Chase Lease #9

Ore Above 7th Level

No. 21 Deposit	3,155 Tons
" 61 "	28,989 "
" 75 " (formerly "B" Deposit)	75,368 "
" 78 " ( " West " )	<u>115,250 "</u>
Total	<u>112,762 "</u>

Ore Above 8th Level

No. 33 Deposit (Main Deposit)	604,072 "
" 61 "	14,143 "
" 75 " (Formerly "B" Deposit)	313,630 "
" 76 " ( " "C" " )	32,198 "
" 77 "	13,796 "
" 78 " ( " West " )	<u>8,672 "</u>
Total	<u>986,511 "</u>

Ore Below 8th Level

No. 33 Deposit (Main Deposit)	323,051 "
" 75 " (formerly "B" Deposit)	58,688 "
" 76 " ( " "C" " )	<u>33,937 "</u>
Total	<u>415,676 "</u>

Total Chase Lease #9 (Standard Ore)	1,514,949 "
" " " " (High Sulphur)	<u>13,893 "</u>

GRAND TOTAL CHASE LEASE #9 1,528,842 "

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<u>Chase Lease #24</u>		
<u>Ore Above 8th Level</u>		
No. 33 or Main Deposit	31,566	tons
" 79 " "	<u>7,582</u>	"
Total	<u>39,148</u>	"
<u>Ore Below 8th Level</u>		
No. 33 or Main Deposit	51,255	"
" 79 " "	<u>15,375</u>	"
	66,630	"
Carried forward from 1937 Estimate	<u>36,405</u>	"
Total	<u>142,183</u>	"
High Sulphur Ore #79 Deposit	<u>55,147</u>	"
GRAND TOTAL CHASE LEASE #24	<u>197,330</u>	"
<u>Chase Lease #25</u>		
Ore Above 7th Level	22,937	"
Ore 7th to 8th Level	<u>10,336</u>	"
TOTAL CHASE LEASE #25	<u>33,273</u>	"
<u>Chase Lease #26</u>		
Above 7th Level	9,687	"
7th to 8th "	<u>16,453</u>	"
TOTAL CHASE LEASE #26	<u>26,140</u>	"
<u>G. C. I. Co's Lands</u>		
<u>Ore Above 7th Level</u>		
No. 21 Deposit	34,530	"
" 33 " "	<u>1,984</u>	"
Total	<u>36,514</u>	"
<u>Ore Above 8th Level</u>		
No. 21 Deposit	8,033	"
" 33 or Main Deposit	362,915	"
" 76 or "C" Deposit	<u>8,100</u>	"
Total	<u>379,048</u>	"
<u>Ore Below 8th Level</u>		
No. 33 or Main Deposit	108,847	"
" 76 or "C" Deposit	<u>8,438</u>	"
Total	<u>117,285</u>	"
GRAND TOTAL - G. C. I. Co. Lands	<u>532,847</u>	"

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6. SURFACE

The things that should be described under this heading are the deep wells, the rebuilding of the main hoists, new stockpile grounds, and new launders.

Both of the deep well pumps operated most of the year. There were some interruptions due to storms, electrical mishaps, and repairs to the pumps themselves due to scouring action of the sand. The following tabulation shows how the water dropped from the beginning of the unwatering period and also the drop in water level for the year.

Test Hole	Distances	Drop in Water Level			Depth Remaining to ledge
		1937	1938	Total	
#501	1700' from #1 Well	3' 6"	6' 8"	10' 2"	83' 1"
502	950' " " "	1' 5"	5' 4"	6' 9"	128' 0"
503	500' " " "	15' 8"	7' 7"	23' 3"	175' 9"
504	550' " " "	16' 0"	13' 1"	29' 1"	119' 5"
505	100' " #2 "	6' 4"	7' 6"	13' 10"	115' 7"
506	1430' " #1 "	3' 4"	5' 11"	9' 3"	77' 8"
507	730' " " "	5' 0"	8' 2"	13' 2"	123' 1"
508	940' " " "	1' 3"		Blocked	130' 8"
509	25' " " "	27' 5"	5' 7"	33' 0"	153' 2"
510	1210' " " "	None	1' 1"	1' 1"	116' 6"

#1 deep well pump started the year by pumping 1900 gallons per minute. By February the gallons pumped averaged 1650. In June this had dropped to 1575 and by the end of the year the figure was down to 1405 gallons per minute.

#2 pump started the year at the rate of 700 gallons per minute and kept up to that figure until June, barring the delays due to pump repairs and break-downs. In July only 340 gallons per minute was being obtained due to installing too small a motor. That fault was corrected and by August 31st the rate had increased to 760 gallons per minute. In October the figure was 640 and on December 31st was down to 580 gallons per minute.

From the very inception of this project the water from the pumps was diverted by launder into the old drainage ditch The C.C.I.Co. dug years ago to keep as much of the drainage from the West off the area over the Morris Mine ore bodies. Along the middle of the summer the Inland management was suspicious that some of the water in this ditch was getting back into the area drained by the pumps and weirs placed at the inlet and outlet end showed a loss of 300 gallons per minute. In order to overcome this difficulty a new launder was constructed for the entire distance East to the Carp River.

The cage and skip hoists were rebuilt because neither drum was large enough to take the rope needed to reach the new 9th level. It was decided to install drums large enough to reach a new 10th level 200 ft. below the new 9th and then also allow another 100 ft. for the skip pit level. The new hoists carry 1 3/8" rope.

A contract was given to Lindberg Brothers to level off and excavate enough stocking room on the North side of the area we excavated in December 1932 to make it possible to erect another trestle. Advantage was taken of the fact that Lindberg Brothers excavated for the new school at the location and also did some work on the new stocking area at the Lloyd Mine. By lining up all three jobs close together, all of us got close and lower bids.

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7. UNDERGROUND

Pump House & Dams

One source of worry for all concerned was the increase in the amount of water running into the mine. It was not until late in the summer that all the dams, the new water discharge line, and the new pumps, were finally installed. To show how the water has increased underground we have compiled the figures for the past five years.

<u>Month</u>	<u>Gallons per Minute</u>				
	<u>1938</u>	<u>1937</u>	<u>1936</u>	<u>1935</u>	<u>1934</u>
January	538	233	225	130	124
February	540	255	201	130	142
March	612	270	202	134	120
April	641	294	204	133	126
May	596	328	202	181	127
June	562	393	202	169	117
July	569	406	206	161	123
August	563	432	207	163	118
September	557	405	203	172	118
October	555	382	210	172	123
November	536	466	233	187	113
December	548	458	201	163	81
Average	568	360	208	158	119

The tables indicate that with minor exceptions there was a steadily rising increment in the gallons per minute all through 1937 up until May 1938 when the upturn ceased and for the first time in months everyone felt relieved.

By March all three dams on the 6th, 7th, and 8th levels were finished and grouted in. Stop logs were piled underground near the dams and for the first time since 1926 it was possible to completely isolate the mine workings from the shaft. That gave us protection also for the Lloyd Mine.

In August the new centrifugal pump was finally installed in the 8th level pump house and by the following month the new motor for the old Aldrich Triplex pump was in place. It was not until another month had passed before the new 8" water column was finished so that by October 1938 the capacity of the 8th level pumping plant was 1600 gallons per minute - 800 from the new Prescott designed to pump straight through to surface, and the other 800 gallons per minute from the old Aldrich and the new centrifugal that relayed water to the 4th level Prescotts. The entire project of building the dams, installing pumps and water column, was done intermittently over 15 months.

High Sulphur Ore

Another distressing feature of the year's operations was the discovery of two more high sulphur areas - one in "B" or #75 Deposit, and the other in a new deposit in the Northwest corner of the 8th level. As already so much has been written in the monthly reports and special reports about this high sulphur ore, we will be brief in this report.



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Developing Contracts

A comparison of the raising and drifting done in ore - both siliceous and standard grade - for the years 1937 and 1938 follows:

	<u>1937</u>	<u>1938</u>
Small 6' x 6' drifts and raises (mostly Silica)	1468'	1500'
Large 8' x 12' raises	185'	110'
Large 10' x 10' drifts	390'	105'
Large 8' x 12' raises (Standard Ore)	55'	None
Small 6' x 6' Raises & Drifts	60'	495'
Large 10' x 10' Drifts	None	180'
Total	<u>2158'</u>	<u>2390'</u>

These figures are made from an inspection of the maps and are only reasonably accurate.

The work done by the developing gangs in detail follows:

C.C.I.Co's Lands

Contract #1 put up a new raise from the 7th level to the 170' sub in #21 Deposit and started a new main scraping drift at the 170' elevation for the purpose of taking out the pillar left to the East of the East boundary of Chase Lease #9 and the old stope that runs over to the 1200 West coordinate line. The pillar also extends from the top of the deposit on the 170 ft. sub level down to the 110 ft. elevation.

On the 50' sub which is nearly half way down to the 8th level Contract #2 drove a 6' x 6' drift 250' across the intersection 3600 South and 1200 West for the purpose of providing a new travelling and timber road and to improve ventilation. This drift connects the main 8th level raises with the triangular shaped deposit in the Southeast corner of the Main or #33 Deposit a short distance Northeast of the Southeast corner of Chase Lease #9.

On the main 8th level to the South of the Main Deposit Contract #24 drove a main level crosscut through the dike for 150 ft. A new raise was then carried up South of the dike in one of the narrow stringers of ore that lies South of Chase Lease #9. The dike which lies on the South boundary of Lease #9 between 2200 and 2400 West has been troublesome because it caves and crumbles.

On the main 9th level considerable work was done on the plat. The tail drift was finished to the North of the storage pockets. The pocket excavation was finished and the concrete walls and partitions poured during the Fall. The plat was cut the full distance for double tracks and the curve towards the ore body started 360 ft. South of the shaft. On the West side of the plat two openings that will eventually be a part of two pump houses were started. About 300 ft. South of the shaft a crosscut was also started on the West side, which is planned to be the beginning of the down grade drift into the proposed sump under the pump houses. All of this work is in the foot and the main drift will have to go Southwest for about 900 ft. before encountering ore. At the time this is being written the breast is 190 ft. beyond the end of the curve.

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Chase Lease #9

Over on the West side of "B" or #75 Deposit a new extension of the deposit was found but unfortunately some of the ore ran high in sulphur. On the -10 ft. sub level 120 ft. above the 8th level an inclined scraping drift was run West parallel and along the 3600 South coordinate line for 300 ft. The middle section or about 100 ft. of the drift encountered high sulphur ore. The only test for width was made near the 2400 West coordinate line and here the ore was developed for 75 ft. North and South. Raises were then carried up as high as the 110 ft. sub or 120 ft. above the main scraping drift and it was found that the top 100 ft. of the ore body was normal standard grade ore. On the 40 ft. sub quite an extensive development was opened up all in low sulphur ore. No one knows what the quality or extent of the ore is below the -10 ft. sub but at the time this report is being written one of the 8th level crosscuts started due West to hit the downward extension of the ore body has hit standard ore and it is low in sulphur. Apparently, therefore, as far as we now know the sulphur area is like an isolated island in the ore body similar to a horse of rock. On the -10 ft. sub an exploring crosscut was also driven parallel with the 2300 West coordinate line but nothing but siliceous material discovered.

On the main 8th level a crosscut was driven diagonally from the middle to the South crosscuts to facilitate the switching of cars and to make it possible to come in via the middle crosscut and out the main footwall drift. A small exploring drift was also driven North alongside Diamond Drill Hole #104 but only narrow lenses of high grade ore were cut.

The big project was over on the West side of the level but most of this work was done on Chase Lease #24. Only a short crosscut parallel with 2600 West was driven South in ore, mostly high sulphur.

Chase Lease #24

Along the east side of this lease a small 6' x 6' drift 350 ft. long connected a cut-out The C. C. I. Co. excavated with a short crosscut driven in 1937 by the Inland Steel Company. The purpose of this crosscut was to provide a short cut for travelling, a means for ventilating the Southwest corner of the mine, and to find out if there were any ore bodies between the two footwall drifts. The project did answer the first two requirements but it did not cut any sizable ore lenses. Practically all of the ore formation between the two main drifts is a low grade second class ore even too low in iron to make a good siliceous grade.

In the extreme Northwest corner of the 8th level territory a high sulphur ore body was outlined between the 2600 and 2800 West coordinate lines. The ore does not run very high above the level and if the ore on the 8th level below the high sulphur ore in #75 Deposit continues to run low in sulphur, the Inland management might be encouraged to expect that on the new 9th level they might develop some low sulphur ore in the Northwest corner of the mine.

Down in the Southwest corner to the West of the Main Deposit a crosscut about 100 ft. long was driven to explore this area but no ore lens of any size was found. The idea is to develop and mine out the Southwest corner of the 8th level as fast as possible and then retreat back Northeast towards the shaft.

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Stoping

C.C.I.Co.Lands

On our lands to the East of Chase Lease #9 Contract #13 finished taking out all the ore left above the main 7th level in the triangular shaped offshoot of the Main Deposit between the foot and the main dike. That means that they have finished the 110, 100, and 90 ft. sub levels. No. 13 also cleaned up the main level and dropped down to the 90 ft. sub below the 7th.

Over to the North of #13 under the hanging #2 mined two small pillars on the 7th and then cleaned up the 70 and 60 ft. subs. They confined the mining to the area between the 1200 West coordinate line and the East line of Chase Lease #9.

Down in the Southwest corner of the area between the 7th and 8th levels three contracts had sub level stopes most of 1938 and as a result practically all the ore in #33 Deposit between the South line of Chase Lease #9 and the main dike and for a distance of 400 ft. East of the East line of Chase Lease #24 and between the 000 ft. sub level and the -90 ft. sub level has been mined. These stopes were wonderful producers and the loss of them means a less proportion of ore to be mined from our own fee lands in the immediate future. There are, of course, other narrow stringers of ore to be mined further South and there is some ore that can be stoped between 2000 and 2300 West along the main foot and when the new 9th level gets out in this territory we should find additional ore South of Chase Lease #9. But the fact remains that in 1939 a smaller proportion of ore will probably be mined from our fee lands.

Chase Lease #9

The topmost gang in the mine was #20 which mined in #75 or old "B" Deposit from the 170 down to the 150 ft. sub level. The ore was taken from the 1600 West to the 1800 West coordinate lines in the Southeast corner of the deposit.

In #61 Deposit two gangs - #6 on the East side and #7 in the middle - spent the entire year slicing in the East side of the deposit on the 140 ft. sub level. Both gangs lost their raises due to crushing and new ones were put up from the main 7th level.

On the 130 ft. sub level #9 worked part of the year slicing under the old sub level stope in the extreme East end of #75 or "B" Deposit.

Dropping down to the 110 ft. sub, two contracts - #4 and #25 - sliced out an area 75' x 250' in the central part of #75 or "B" Deposit. This deposit is split into six sections. Limits of mining have been established for #9 East, #20, #4, #25, #22, and #9 West. Contract #25 also sliced a large pillar on the 90 ft. sub between the limits established for #4 and #22.

Over on the West side of #75 or "B" Deposit Contracts #9 and #22 had two separate sub level stopes. The latter took out the central part of the ore body between 2050 and 2150 West while #9 was over in the extreme West end in that portion of the mine that developed more high sulphur ore in 1938.

In the area between the #75 ore lens and #33 or Main Deposit there is a stringer or offshoot that runs Southwest from #75 and joins another stringer or offshoot going Northwest from the main ore body. Contract #10 stoped from the 7th level down to the 10 ft. sub level.

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In the Southwest corner of the lease in the Northwest stringer of the main ore body, two gangs - #8 and #23 - stoped from -10 ft. sub down to the -80' elevation, the stopes running East and West along the South line of the lease for 500 ft. Not all this area was actually mined in 1938 but the point is that by the end of the year all of this portion of the ore body was exhausted. Late in the year slicing was started on the -80 ft. sub under the old stopes preparatory to slicing out the remaining ore at the bottom of the deposit.

Chase Lease #24

All of the extreme West end of the Main Deposit that could be stoped has been mined down to the -90 ft. sub. On that level slicing was in progress at the close of the year not only on Chase Lease #24 but also for 200 ft. farther East under The C. C. I. Co. fee lands preparatory to slicing out the rest of the ore body down to and below the 8th level.

In fact, a general statement can be made to the effect that at the moment there is little ore in the mine adapted to the sub level stoping system due to extreme width, bad rock walls, or too much water.

Shaft Sinking

The sinking of the main shaft which was started in 1937 was finished in April. During that month the skip level was cut and some rock excavated for the 9th level pocket. Steel sets were used on the new lift. During May and June when the mine was closed as far as the production of ore is concerned, the underground crew was given part time employment putting in sets, dividers, runners, and casing planks. A ladder road was built to the 9th level and work started rebuilding all of the old ladderways from the 8th level to surface to make room for the new 8" water discharge line.

During July, August, and September room was cut for the storage pocket and measuring pocket. Work on the pocket was finished in September and by October the miners had started to open up the new plat on the 9th level.

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1. GENERAL

Loading at this property was not begun until June 8th, or two months later than the previous year. Loading was carried on intermittently throughout the season on a single shift basis with two shovels in the West Pit and one in the East. Production was 85,589 tons as compared with 305,418 in 1937, a decrease of 219,829 tons. Production and shipments were completed on November 1st and winter repairs to plant and equipment were started immediately. The following tonnages were produced in the various pits: West - 66,815, East - 18,774, Summit - 0, total 85,589. All of the above ore was shipped as Tilden Silica, no Low Phosphorus or Silica No. 1 being separated as such.

A relatively small amount of churn drilling was done in the East Pit and the East half of the West Pit during the first five months and last two months of the year, the drill crews being employed at other tasks during the operating season. A small amount of stripping was done in the East Pit and on the lower bench in the West Pit by Company men and equipment, the work being practically completed in both areas.

A single primary blast was made in July in the East half of the West Pit in order to produce enough high grade ore to permit proper grading. The estimated tonnage broken was 45,000. The new 9" drilling equipment was used almost exclusively with the exception of drilling the sinking cut in the approach to the lower bench. The results with these larger drills have been so satisfactory that there will probably be no future occasion when the 6" drills will be used.

The approach from the lower bench in the West Pit to the West side of the crusher building was practically completed by the end of the year.

2. PRODUCTION  
SHIPMENTS &  
INVENTORIES

a. Production by Grades

	<u>Tilden</u> <u>Silica</u>	<u>Tilden</u> <u>Silica #1.</u>	<u>Low</u> <u>Phosphorus</u>	<u>Total</u>
West Pit	66,815	-	-	66,815
East Pit	18,774	-	-	18,774
Summit Pit	-	-	-	-
Total	85,589	-	-	85,589

Due to the fact that no special orders were received during 1938, no Low Phos. or Tilden Silica No. 1 was separated from the East Pit product. Ore loaded from this pit was mixed with the West Pit product and shipped as Tilden Silica.

b. Shipments

Shipments from the mine for 1938 were the same as the production figures of 85,589 tons.

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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES (CONT.)

c. Stockpile Inventories

There is no ore stocked at the Tilden Mine. The following are the book figures of the broken ore reserves in the several pits:

West Pit- - - - -	* 0 Tons
East Pit- - - - -	32,354 "
Summit Pit- - - - -	7,032 "
Total Broken Ore Dec. 31, 1938 - -	39,386 Tons.

The above book figures compare with 58,160 tons at the end of 1937, a decrease of 18,774 tons.

\*The above table shows merely the book figures of broken ore reserves. These are obtained by subtracting actual shipments from the estimated tonnages produced by the primary blast. As was mentioned in the report for last year, there was and still is a considerable tonnage of broken ore in the West Pit which represents an overrun that has been accumulated since the pit was first opened. In the West Pit in addition to the above book figures, there are approximately 17,000 in the East portion and 15,000 in the West or a total of 32,000 tons broken and available. In the East Pit, several thousand additional tons will be available due to the secondary work on the North toe which would increase the 32,000 ton book figure to at least 36,000 tons. The combined inventory for both pits is, therefore, approximately 68,000 tons broken and ready for 1939 operations.

Of the accumulated overrun in the West Pit, 60,314 tons have been loaded and shipped to date, 38,499 tons during 1937 and the remainder during 1938.

e. Product by Months

<u>Month</u>	<u>Days Operated</u>	<u>Average Daily Tonnage</u>	<u>Total Tons.</u>
June	8 (1-8 hr.)	1,656	13,247
July	4 (1-8 hr.)	2,478	9,915
August	4 (1-8 hr.)	2,296	9,186
September	5 (1-8 hr.)	2,457	12,285
October	18 (1-8 hr.)	2,245	40,412
November	1 (1-8 hr.)	544	544
TOTAL	40 (1-8 hr.)	2,140	85,589

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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES (CONT.)

e. Product by Months (Cont.)

The average output per 8 hour shift of 2,140 tons during the current year compared with 1,996 tons per shift during 1937, an increase of 144 tons. This increase is due, at least in part, to the fact that the intermittent operation permitted repairs to shovels and equipment during the days when the Pit was not operating thereby considerably decreasing production delays.

f. Ore Statement

	<u>1938</u> <u>Tons</u>	<u>1937</u> <u>Tons</u>
On hand January 1, 1938 - - - - -	-	-
Output for year - - - - -	<u>85,589</u>	<u>305,418</u>
Total - - - - -	85,589	305,418
Shipments - - - - -	<u>85,589</u>	<u>305,418</u>
Balance on Hand - - - - -	-	-
Decrease in output - - - - -	219,829	
Decrease in shipments - - - - -	219,829	

1936 - 77 - 1-8 hr. shifts and 57 - 2-8 hr. shifts. Total 191 - 1-8 hr. shifts.  
1937 - 113 - 1-8 hr. shifts and 20 - 2-8 hr. shifts. Total 153 - 1-8 hr. shifts.  
1938 - 40 - 1-8 hr. shifts and 0 - 2-8 hr. shifts. Total 40 - 1-8 hr. shifts.

g. Delays

The only serious operating delay which occurred during the year was the breakdown of No. 31 shovel in the East Pit, which put that loading unit out of commission for the remainder of the season. This occurred on the 25th of October and since loading was completed on the first of November, the breakdown was not serious from the standpoint of production. The total lost time chargeable to the three shovels was 50½ hours as is shown in the table below. The bulk of this was due to the breakdown of No. 31 shovel and compares with 114½ hours lost time during 1937.

<u>No. 29</u>	<u>No. 31</u>	<u>No. 46</u>	<u>Total</u>
2-1/4	38 1/2	9 3/4	50 1/2

No. 46 shovel held up much better during 1938 due to the fact that extensive repairs were made on it prior to the opening of the loading season. This unit lost 9 3/4 hours as compared with 59 3/4 the previous season. Other miscellaneous delays are listed below:

<u>Crushing</u> <u>Plant.</u>	<u>Lack of Electric</u> <u>Power</u>	<u>Transportation</u> <u>Equipment.</u>	<u>Total</u> <u>Misc.</u>
2 1/4 hours	0	1 hour	3 1/4 hrs.

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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES (CONT.)

g. Delays (Continued)

The estimated loss of product due to the above delays is as follows:

Shovels - - - - -	4,938 Tons
Miscellaneous - -	700 "
Total - - - - -	5,638 Tons

h. Delays From Lack of Current

As was mentioned in the report for 1937, the installation of the new sub-station and transformers at this property have practically eliminated all delays and equipment failures due to insufficient current.

3. ANALYSIS

a. Average Mine Analysis on Output

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss on</u> <u>Ignition</u>
Tilden Silica	39.23	.036	41.70	.09	.70	.22	.20	.011	.23

b. Average Analysis on Straight Cargoes

	<u>Iron</u>	<u>Mine</u> <u>Phos.</u>	<u>Sil.</u>	<u>Lake Erie</u> <u>Iron</u>	<u>Moist.</u>
Tilden Silica	39.26	.036	42.04	39.86	1.84

c. High Sulphur Ore

The high sulphur ore lying in the West portion of the East end of the West Pit was successfully added to and mixed with the West Pit product throughout the loading season without materially increasing the average sulphur content. As was indicated by former exploration drilling, some small areas averaged nearly .200 in Sulphur but loading was so regulated that only minimum amounts of this ore were included in any single cargo. The continued use of three shovels is necessary to successfully grade the different shipments and still maintain production.

The reserves in the West part of the West Pit, which were drilled in 1937 and not yet blasted, contain a small amount of high sulphur material in the East portion. This material will have to be handled in a like manner.



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4. ESTIMATE OF ORE  
RESERVES

a. Developed Ore

1. West Pit

The following estimate of ore reserves for the West Pit was made during 1937 and reported in the Annual Report for that year. Accordingly this estimate is now being brought up to date using the estimate of ore blasted during the current year and new estimates of the overrun broken and present in the West Pit.

Assumption: 13.5 cu. ft. equal 1 ton.

Grade: Tilden Silica

West Portion of West Pit, Upper Bench - - - - -	280,000 tons
East " " " " " " - - - - -	195,000 "
Total Unbroken Reserves - - - - -	475,000 tons
Blasted July, 1938 - - - - -	45,000 "
Total Unbroken Reserves - - - - -	430,000 tons
Broken Reserves (Estimated Overrun) - - - - -	32,000 "
Total Upper Bench - - - - -	462,000 tons
Reserves Lower Bench (60' deep) - - - - -	2,000,000 "
Total Developed Ore, January 1st, 1939, West Pit - - - - -	2,462,000 tons

2. East Pit including Summit Pit

Assumption: 14 cu. ft. equals 1 ton  
10% deduction for rock  
Tonnage above 1500' Elevation  
(Track grade from Crushing Plant)

Total Ore in sight Jan. 1, 1938 - - - - -	5,237,998 tons
Ore mined in 1938 - - - - -	18,774 "
Total Developed Ore Jan. 1, 1939 - - - - -	5,219,224 tons

Of this total of 5,219,224 tons, approximately 2/5 is expected to grade above .015 Phos. and 3/5 below .015 Phos. These figures, based on 1930 diamond drill exploration, have so far not been proved by the small tonnage mined at the base of the hill. The tonnage explored covers so large an area that it will be years before much of it is actually developed by mining. Until such time as results prove otherwise, the available ore at the East Pit can conservatively be estimated as analyzing .026 in Phos. which by selective mining and grading, can be made to yield a product of which approximately 25% would run .015 Phos. or lower.

As discussed in the report for 1937, operations at Summit Pit have been abandoned as such, although it is probable that these reserves will ultimately be mined from the present floor of the East Pit.

3. Developed Ore as of January 1, 1939:

West Pit - - - - -	2,462,000 tons
East Pit (Including Summit) - -	5,219,224 "
Total Tilden Mine - - - - -	7,681,224 tons

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4. ESTIMATE OF ORE  
RESERVES (CONT.)

b. Prospective Ore

In addition to the developed ore, there is probably a considerable tonnage to the North and East of the area developed by drilling at the East and Summit Pits. The reserves in the West Pit are definitely limited by dikes, over-burden and lean material as explained in the letter regarding E. & A. #786 for stripping and opening the lower bench. Under present conditions, there is no further prospective ore in this portion of the property. The ultimate expansion of operations will probably be a continuation of the East Pit which will extend to the North and East, eventually including Summit Pit. The recovery of the ore above the lower bench in the West Pit will be accomplished by mining with the present floor as the top of the face, and a plane 10' below the elevation of the L. S. & I. tracks as the new floor. The total height of face will be approximately 60'.

c. Estimated Analysis of Reserves

1. <u>West Pit</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Ign.</u>	<u>Moist.</u>
Dried	39.25	.038	42.20	.09	.60	.28	.20	.013	.25	-
Natural	38.50	.037	41.40	.09	.59	.27	.20	.013	.25	1.90

As discussed in the 1937 report, the above analyses were changed from those originally reported to take into consideration lean spots and small dikes that were not considered in the original estimate.

2. <u>East Pit</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Ign.</u>	<u>Moist.</u>
Dried	37.00	.020	46.50	.120	.67	.48	.31	.014	.90	--
Natural	36.25	.020	45.40	.118	.65	.47	.30	.013	.88	2.50

f. Estimate of Production

The following tables show the estimated productions and analyses that can be produced during the coming year. The first table shows the tonnages obtainable by mining and shipping without selective loading from the East Pit. The 7,000 tons of broken ore in Summit Pit have been omitted from the tables, since it would be highly impractical to attempt to load this ore at the present time.

The figures in the second table are based on the assumption that any low Phos. ore desired will be produced by selective loading in the East Pit.

<u>ESTIMATE OF 1939 PRODUCTION AS TO PITS</u>							
1. -	<u>Tonnage</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>	<u>Iron Nat'l.</u>
Tilden Silica West Pit	350,000	39.12	.049	42.50	.014	1.90	38.38
Tilden Silica #1 East Pit	100,000	37.50	.020	46.00	.011	2.00	36.75
<b>Total</b>	<b>450,000</b>	<b>38.80</b>	<b>.045</b>	<b>43.30</b>	<b>.011</b>	<b>1.92</b>	<b>38.03</b>

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4. ESTIMATE OF ORE  
RESERVES (CONT.)

f. Estimate of Production (Cont.)

<u>ESTIMATE OF PRODUCTION BY GRADING EAST PIT ORE</u>							
<u>Grade</u>	<u>Tonnage</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>	<u>Iron Nat'l.</u>
Tilden Silica (Includes West Pit and 50,000 tons from East Pit)	400,000	38.80	.040	42.50	.014	2.00	38.03
Tilden Low Phos. (Selected from East Pit shipments)	<u>50,000</u>	37.50	.015	46.50	.011	2.00	36.75
Total.....	450,000						

From the above tables it will be noted that the low Phosphorus ore can be obtained only by analyzing each car and segregating those that contain the proper material. Using this method, a cargo can be obtained only by accumulating a sufficient number of cars and holding them for shipment. This arrangement, though not ideal, has proved more satisfactory than the old method of handling the product from Summit.

The above estimated analyses of the 1939 production have been changed somewhat from those previously reported. These changes were obtained by averaging the ore which is now drilled and ready to blast in both pits and by carefully considering the methods that are necessary to grade the different ores while shipping is in progress.

The average analysis of the ore drilled in the West portion of the West Pit is 37.31% Iron dried. This is lower than usual due to a large amount of dike encountered in the holes. The assumption is that enough of this dike can be removed from the ore to raise the above average to 38.25%. The East portion of the West Pit, which has not yet been drilled for the next blast, will average at least 40% Iron dried as will the sinking cut to the lower bench. Assuming that one-half of the West Pit product will be obtained from the West portion, and the remainder from either the East portion or the sinking cut or both, an average of 39.12% Iron is obtained for the West Pit product as a whole.

The reserves drilled in the East Pit average 38.20% Iron, which is a little higher than that obtained during previous years. The East Pit proportion of the total product is approximately 30% and the West Pit 70% which gives an average of 38.80% Iron for the combined product of both pits. This is the figure which should be used for the 1939 guarantee, i.e. 38.80% Iron dried, 38.03% Natural.

Although the ore in the East Pit is expected to average 38.20% Iron, the actual guarantee for the Tilden Low Phos. Ore (selective loading, East Pit only) should be reduced to 37.50% Iron Dried or 36.75% Natural due to the fact that there are lean areas which can not be avoided due to the shape of the Pit.

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5. LABOR  
AND  
WAGES

a. Comments

1. Labor

Labor conditions during 1938 were satisfactory in that there was no shortage of men at any time. The average number of employees was decreased from 37 in 1937 to 30 in 1938 and the working schedule for these was, at best, intermittent due to the very irregular loading schedule. A number of the men were employed at other properties with the Company during idle days at the Pit, several being used for the bulk of the summer on a pipe repair job for the Cliffs Power & Light Company. The Mine Captain, himself, spent considerable time on this project.

N.R.A. regulations, as such, were officially discontinued in July, 1937 but have been adhered to ever since with the exception of a few instances when overtime work was necessary. Time and a half was paid for all overtime work in excess of 40 hours in any one week or 8 hour in any one day.

b. Comparative Statement of Wages & Product

	<u>1938</u>	<u>1937</u>	<u>Increase</u>	<u>Decrease</u>
Product	85,589	305,418		219,829
Number of shifts and hours	40 - 1-8 Hr.	113 - 1-8 Hr. 20 - 2-8 Hr.		73 - 1-8 Hr. 20 - 2-8 Hr.
Average number of men working	30	37		7
Average daily wage	\$5.58	\$5.84		\$0.26
Tons per man per day	41.86	45.50		3.64
Labor Cost per ton (Labor Stmt.)	.137	.129	.008	
Labor Cost per ton (Cost sheet)	.155	.142	.013	
Total number of days	4186	6712.5		2526.5
Amount paid for labor as per Labor Statement	\$11,749.09	\$39,246.99		\$27,497.90
Amount paid for labor as per Cost Sheet	13,226.41	43,400.98		30,174.57

The decrease in the average wage shown in the above table is due largely to the fact that the amount of work done by the high wage laboring group was considerably less in proportion than in 1937. This group, for the most part, consists of shovel runners and drill men.

6. SURFACE

Routine repairs were made to equipment and buildings as necessary.

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7. OPEN PIT  
OPERATIONS

a. Stripping

There was a considerable amount of work done under E. & A. No. 786 in stripping and washing the East Pit, the West half of the West Pit on the upper bench and in the lower bench of the West Pit. At the end of the year, all of these operations had been practically completed with the following exceptions: The washing of the stripped area in the East Pit, the completion of the washing of the stripped area in the upper bench of the West Pit, the clearing out of the culvert under the L. S. & I. tracks in the lower bench of the West Pit, and the placing of the necessary crushed surfacing material on the road and approach to the lower bench. The purpose for which E. & A. No. 786 was originally authorized and the bulk of the work was discussed at considerable length in the Annual Report for 1937. The work done during 1938 was merely a continuation of the several items in the E. & A.

In addition to the authorized work, the cost of two other items was charged to the E. & A. These are the construction of an approach to the West side of the crusher building and the removal of 1,582 cubic yards of rock and waste material from the West Pit. In the case of this latter charge, it was desirable to defer this cost and spread it over future production rather than charge it against the production for the current year.

Operations under the above E. & A. were stopped for the winter early in January. Work was resumed in April, carried on intermittently throughout the remainder of the year, and brought to a close in November.

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7. OPEN PIT  
OPERATIONS (CONT.)

a. Stripping (Cont.)

The several operations and items are listed below as well as the expenditures and quantities completed during the current year and the total to date:

ORIGINAL ESTIMATE	WORK ACCOMPLISHED	EXPENDITURE 1938	EXPENDITURE 1937	EXPENDITURE TO DATE	COST PER UNIT
Lower Bench - West Pit Approach to Crusher Bldg.*	Completed	\$ 519.03	-	\$ 519.03	
Moving Power Line..... \$1,000	"	-	\$ 638.95	638.95	
Stripping 30,000 cu. yds at 40¢ per yd..... 12,000	41,607	2,057.47	4,759.11	6,816.58	\$0.164 per cu. yd.
220 Lineal feet C.M.P. at \$5.00 in place..... 1,100	210 in place	-	1,014.28	1,014.28	\$4.83 per ft.
Clearing & Grubbing..... 500	Completed	-	528.43	528.43	
Washing..... 1,000	Nearly Compl.	4,219.65	166.67	4,386.32**	
Castng L.S. & I. Tracks.. 250	Completed	295.68	766.44	1,062.12	
Surfacing 3,000 cu. yds at 50¢ per yd..... 1,500	Nothing	-	-	-	
Miscellaneous Material... 400	-	-	-	-	
TOTAL.....\$ 17,750					
Plus 10%..... 1,775					
TOTAL LOWER BENCH....\$ 19,525		7,091.83	7,873.88	14,965.71	
Waste Rock - West Pit*... 0	1582 cu.yds.	315.52	-	315.52	\$0.199 per yd.
Stripping 3,000 cu. yds. on West side of West Pit. 1,500	2700 cu.yds.		350.59	350.59	\$0.126 per yd.
Stripping 2,000 cu. yds. on West side of East Pit. 1,000	2500 cu. yds.	125.23	784.02	909.25	\$0.363 per yd.
GRAND TOTAL \$22,025		\$7,532.58	\$9,008.49	\$16,541.07	

\* Not included in original estimate.

\*\* Includes \$867.27 Upper Bench.

Most of the above operations were thoroughly discussed in the report for 1937. Further remarks are listed below:

Approach to Crusher Building: This item was not included in the original estimate but was necessary since the ore transported from the lower bench will have to be dumped into the West side of the crusher so as not to interfere with the trains which discharge from the North side. Inasmuch as the bulk of this structure was to be built with material obtained from the stripping operations, it was necessary to prepare the approach while trucks were available for transporting the material. The amount expended under this item consists primarily of testing for bed-rock in the vicinity of the crusher building and preparing forms and pouring concrete for three small retaining walls which were found necessary. The first of these was

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7. OPEN PIT  
OPERATIONS (CONT.)

a. Stripping (Cont.)

placed for the purpose of reinforcing the present wall against the heavy loads expected and the other two to prevent material from spilling into the crusher building. Twenty-two cubic yards of reinforced concrete were placed at a cost of \$14.73 per yard, including cement, aggregate, reinforcing steel, form material and labor. The rest of the expenditure was made in preparing the sub grade and rip-rapping the finished fill.

Moving Power Line: This item was completed in 1937 and discussed in the Annual Report for that year. A clerical error in copying the original draft of the E. & A. was responsible for the omission of the \$1,000 item in the original cost estimate. Since then all expenditures under this heading have been carried in red as an item exceeding the original estimate. This is an error since the \$1,000 estimated cost is included in the total of \$19,525.00 for the lower bench.

Stripping 30,000 cubic yards: This item has considerably exceeded the original estimate as to quantity, since 41,607 yards have been moved to date. However, this item shows a considerable underrun as to cost since the expenditure per cubic yard has averaged 16.4¢ instead of the original estimate of 40¢, which was based on the average price for work done under contract. The use of Company equipment and men has greatly reduced the cost per cubic yard.

Placing Culvert Pipe: This operation was practically completed during 1937 and discussed in the report for that year. One 10' length remains to be placed as soon as conditions permit. A bad storm during the current year partially blocked the upstream end of the pipe which will necessitate considerable work next year to effect a reopening.

Clearing & Grubbing: This item was completed in 1937 and is discussed in the report for that year.

Washing: As originally set up, this item was estimated at the nominal sum of \$1,000 and was intended to include only the washing of the lower bench. Since then the scope has been broadened to include the West side of the West Pit and also a small area in the East Pit. To date, the amount expended has greatly exceeded the original \$1,000 estimate due, for the most part, to the fact that large amounts of hard pan and boulders were encountered. At the end of the year, this work had been almost completed with the exception of several days washing to be done in the West portion of the West Pit on the upper bench and a small area to be washed on the North side of the East Pit.

Casting L. S. & I. Tracks: This item was discussed at some length in the 1937 report and the bulk of the work was done during that year. The relatively small amount left at the end of 1937 was completed in 1938.

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7. OPEN PIT  
OPERATIONS (CONT.)

a. Stripping (Cont.)

Surfacing: This item has been estimated as requiring 3,000 cubic yards of crushed ore at an average cost of \$0.50 per cubic yard at the mine pocket, and can be produced and put in place during slack times at the pit. None of this has been done to date.

Waste Rock Removal - West Pit: The expenditure of \$315.52 under this heading covered the cost of loading and removing 1,582 cubic yards of dike and other lean material from the West Pit. The work was done during November and the cost charged to this E. & A. in order to defer the charge instead of absorbing it during November when only 544 tons of ore were produced.

Stripping 3,000 cubic yards from the West Side of the West Pit: This item was completed during 1937 with a rented R-D-6 Caterpillar tractor equipped with an angle-dozer and was thoroughly discussed in the report for last year.

Stripping 2,000 cubic yards on the West Side of the East Pit: The bulk of this work was done in 1937 and discussed in the report for that year. The operation consisted of removing the material using a large scraper and a 50 H.P. scraper hoist. A small amount was done early in 1938 completing the operation. In November, a stripping demonstration was put on by the Brebner-Sinz Machinery Company of Green Bay and Marquette using an R-D-8 Caterpillar Diesel tractor equipped with a LaPlant-Choate hydraulic angle-dozer. The work was done in the same vicinity on the West side of the East Pit that had previously been stripped as clean as possible with the scraper and scraper hoist. This machine worked a total of five hours during which 800 cubic yards of overburden and lean ore were removed. The bulk of this material thus moved was so situated in cracks and crevices that the scraper could not pick it up. Without the above mentioned equipment, it would have been necessary to remove the material by hydraulic washing, which is very expensive. This demonstration showed conclusively the complete fitness of the equipment for stripping under the most difficult conditions. The one remaining operation necessary to prepare the East Pit for a primary blast next year is the washing of the above mentioned stripped area.

b. Development

There was no development of new ore at this property during 1938, since the ore uncovered had already been outlined by test drilling and the ore in the lower bench in the West Pit has been carried as developed ore for a number of years.

f. Drilling, Blasting & Explosives

1. Drilling

Primary blast hole drilling totaled 5,730 feet during the year as compared with 9,055 during 1937, a decrease of 3,325 feet. No holes were lost during the current year as compared with 80' in 1937 and 446' in 1936. The effective



TILDEN MINE  
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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

drilling in 1938 was, therefore, 5,730 feet as compared with a net of 8,975 in 1937, a decrease of 3,245' or 36.2%. The bulk of the above drilling was done with the new 29-T 9" drills, both of which were used throughout the year, the 6" machines being used merely to complete the drilling of the sinking cut to the lower bench of the West Pit. 2,000 feet were drilled by the 6" machines to complete this operation.

A complete discussion of the relative merits of the two size machines can be found in the report for 1937 with little more to be added in regard to the current years drilling. The new machines are faster, more powerful and much less likely to become stuck than the smaller type as witnessed by the fact that 1938 is the first year during which no holes were lost through the sticking of bits.

No churn drilling was done in the West portion of the West Pit since the loading schedule was not heavy enough to permit cleaning up of the broken ore in that vicinity, and the next blast was completely drilled during 1937. 901 feet were drilled in the East portion of the West Pit for a small blast which was shot in July of this year. The remainder of the 9" churn drilling consisted of 2929 feet in the East Pit in preparation for the next blast which will be the largest ever put off in the East side of this property. This row of holes runs from the extreme South edge of the Pit along the East and North sides to the extreme West end.

A new item has been added to the record of drilling costs this year which in former years has been included under the general heading of Depreciation of Plant and Equipment. This item, Depreciation of Drilling Equipment, is now included in the cost record for the 9" holes and amounts to \$0.465 per foot in the West Pit and \$0.431 per foot in the East, no charge being made for depreciation on the 6" holes.

In comparing the average costs for the 6 and 9" holes and in comparing 1938 costs with 1937, the figures used are before the above depreciation charge is added. The combined cost of the net footage drilled was \$1.93 per foot as compared with \$1.88 in 1937. This is due almost entirely to charges for maintenance and new parts which were spread over a relatively small footage for the year.

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Cost of Operating 9" Churn Drills in West Pit, 1938

Total Footage of holes drilled - - -	901
Total Footage of holes lost - - -	<u>0</u>
Net Available Footage - - - -	901

<u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost Per Foot</u>
Drilling at Mine	\$ 546.12	\$ 64.78	\$ 610.90	.678
Sharpening Bits	221.60	77.68	299.28	.332
Pipe & Fittings	7.50	112.20	119.70	.133
Rope		9.95	9.95	.010
Drilling Tools			0	
Electric Power		101.10	101.10	.112
Truck and Tractor	176.74	76.84	253.58	.281
Total Operating....	<u>\$ 951.96</u>	<u>\$ 442.55</u>	<u>\$ 1,394.51</u>	1.546
 <u>Maintenance</u>				
Drill Sharpener Equipment	\$ 48.90	\$ 57.15	\$ 106.05	.117
Drill Maintenance	15.66		15.66	.017
Total Maintenance	<u>\$ 64.56</u>	<u>\$ 57.15</u>	<u>\$ 121.71</u>	.134
 Total Maintenance				
& Operating.....	<u>\$1,016.52</u>	<u>\$ 499.70</u>	<u>\$1,516.22</u>	1.68
Depreciation of Churn Drill Equipment...			<u>417.00</u>	.465
Total Maintenance, Operating and Depreciation.....			<u>\$1,933.22</u>	2.145

TILDEN MINE  
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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Cost of Operating 6" Churn Drills in West Pit, 1938

Total Footage of holes drilled - - - 2,009  
Total Footage of holes lost - - - - 9  
Net Available Footage - - - - - 2,000

<u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost Per Foot</u>
Drilling at Mine	\$1,869.16	\$ 102.38	\$ 1,971.54	.985
Sharpening Bits	174.82	62.83	237.65	.118
Pipe & Fittings	97.29	375.91	473.20	.236
Rope		14.80	14.80	.007
Drilling Tools			0	
Electric Power		226.08	226.08	.113
Truck and Tractor	128.09	66.98	195.07	.097
Building Roads	195.00		195.00	.097
Total Operating....	\$2,464.36	\$ 848.98	\$3,133.34	1.653

Maintenance

Drill Sharpener Equipment	33.50		33.50	.016
Drill Maintenance	163.19	69.81	233.00	.121
Total Maintenance...	196.69	69.81	266.50	.137

Total Maintenance and Operating.....	\$2,661.05	\$ 918.79	\$3,579.84	1.79
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Cost of Operating 9" Churn Drills in East Pit, 1938

Total Footage of holes drilled - - - 2,829  
Total Footage of holes lost - - - - 0  
Net Available Footage - - - - - 2,829

<u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost Per Foot</u>
Drilling at Mine	\$2,209.52	\$ 210.05	\$2,419.57	.855
Sharpening Bits	735.17	251.91	987.08	.348
Pipe & Fittings	59.63	298.16	357.79	.130
Rope		127.50	127.50	.045
Drilling Tools	15.00	194.10	209.10	.072
Electric Power		472.48	472.48	.167
Truck & Tractor	673.41	223.44	896.85	.318
Total Operating....	\$3,692.73	\$1,777.64	\$5,470.37	1.935

Maintenance

Drill Maintenance	199.90	176.39	376.29	.133
Drill Sharpener Equipment	86.07	41.28	127.35	.045
Total Maintenance...	\$ 285.97	\$ 217.67	\$ 503.64	.178

Total Maintenance and Operating	\$3,978.70	\$1,995.31	\$5,974.01	2.113
Depreciation on Churn Drill Equipment....			1,225.43	.431
Total Maintenance, Operating & Depreciation.....			\$7,199.44	2.544

TILDEN MINE  
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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Combined Cost of Operating Churn Drills, 1938

	<u>Total Net Footage</u>	<u>Total Cost</u>	<u>Cost Per Foot</u>
West Pit, 6" holes	2,000	\$ 3,579.84	1.790
West Pit, 9" holes	901	1,516.22	1.680
East Pit, 9" holes	2,829	5,974.01	2.113
Total	5,730	\$11,070.07	1.932
Depreciation of churn drill Equipment.....		1,642.43	.286
Total	5,730	\$12,712.50	2.218

In comparing the costs of drilling with the two size machines in the West Pit, where the type of material drilled was more or less uniform, the 9" drills show \$1.68 per foot before depreciation of equipment as compared with \$1.79 per foot for the 6" machines. In the East Pit, where the material is much harder to drill, the average cost for 9" holes was \$2.11.

The following tables show a comparison between the drilling speeds of the different size machines in the two pits and the average footage drilled per bit:

Drilling Speeds, Year 1938

<u>Location</u>	<u>Drill No.</u>	<u>Shifts Worked</u>	<u>Footage Drilled</u>	<u>Average Footage Per 8 Hour Shift.</u>
West Pit (6")	5	77	952	12.36
West Pit (6")	6	77	1,048	13.60
Total West Pit 6" Holes		154	2,000	12.98
West Pit (9")	8	42	901	21.45
Total West Pit 9" Holes		42	901	21.45
East Pit (9")	7	103	1,887	18.32
East Pit (9")	8	57½	942	16.38
Total East Pit 9" Holes		160½	2,829	17.62
<u>West Pit</u>		<u>Bits Used</u>	<u>Footage Obtained</u>	<u>Footage Per Bit</u>
6"	213		2,000	9.38
9"	165		901	5.47
<u>East Pit</u>				
9"	630		2,829	4.49

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

The first of the above tables shows the superior speed of the 9" machines even when comparing the East Pit where drilling is much harder than in the West. As regards the table showing the number of feet obtained per bit, the large amount shown by the 6" drills is due to the fact that the drilling was done in an area where the surface is badly weathered and where very short holes were necessary. In a situation such as this, bit wear is considerably lowered due to the large amount drilled in the weathered material.

2. Blasting

The single primary blast of the year was shot in the East portion of the West Pit in July, the reserves of broken ore in the other two loading areas being sufficient for current needs. This blast, which broke an estimated 45,000 tons, consisted of fifteen 9" holes loaded with varying amounts of 90 and 75% Gelatine Powder and Gelamite No. 2. This loading was somewhat of a departure from our former practice in that previous 9" shots were loaded with 80% Gelatine and Gelamite No. 2 only. As far as can be determined, the results obtained were very good, a minimum of large chunks having been encountered to date. No primary blasts were necessary in the West portion of the West Pit since the amount of accumulated overrun in that vicinity has not yet been cleaned up. Primary drilling for the next shot was completed in 1937.

At the end of the year, the East Pit drilling had practically been completed in readiness for a large shot during the coming season. Following is a tabulation of blast results, of the shot in the East half of the West Pit:

<u>Blast No.</u>	<u>Date</u>	<u>No. of Holes.</u>	<u>Footage</u>	<u>Lbs. of Powder</u>	<u>Estimated Tonnage</u>	<u>Tons of Ore per Pound of Powder</u>
1	7-8-38	15 (9")	968	16,450	45,000	2.75

In comparing the above it will be noted that the powder factor is somewhat smaller than the previous practice. This was done in an attempt to secure better fragmentation and excellent results were obtained.

Secondary drilling and blasting, carried on throughout the loading season, caused the usual amount of expense and trouble. The amount of such work done during the operating shifts was practically the same and consisted largely of reducing large chunks to the proper size for loading. Jackhammers equipped with waterheads were used for this work, in some cases assisted by the tripod drills also used with water.

In addition to the routine secondary drilling and blasting discussed above, there was a large amount of this work carried on throughout the year along the North toe of the East Pit. For some years past, advance in this Pit was in an Easterly direction with no holes being put down on the North side.

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.)

Subsequent weathering caused the material along the North face to slough off and accumulate along the toe. After loading was finished in 1937, a considerable amount of this material was cast away in order to permit secondary work along the toe. This work was continued intermittently throughout 1938 with considerable success due largely to the tripod drills which were first introduced in 1937, with a small amount remaining to be finished early in 1939 in advance of the large blast which will be necessary.

STATEMENT OF COST OF EXPLOSIVES USED FOR YEAR ENDING  
DECEMBER 31, 1938

Primary Blasting

<u>Kind</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
Gelamite No. 2 .....	10,000 lbs.	\$ 12.25	\$ 1,225.00
75% L.F. Gelatine.....	3,450 "	14.00	483.00
90% L.F. Gelatine.....	3,000 "	17.50	525.00
Total Powder.....	16,450 lbs.	\$ 13.57	\$ 2,233.00

<u>Blasting Supplies</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
#2 Wire Countered C.B. Fuse.....	1,016 ft.	\$ 65.00 M	\$ 66.04
Plain C. Bickford Fuse.....	501 "	42.00 M	21.04
Total Blasting Supplies...			\$ 87.08

Total All Explosives... \$2,320.08

Total Ore Blasted in 1938.....	45,000 tons
Pounds of Powder per ton of ore.....	.365
Cost per ton for Powder.....	.0496
Cost per Ton for Fuse, Caps, etc.....	.0019
Cost per Ton for all Explosives.....	.0515
Average Price per Pound for Powder.....	.1357

Secondary Blasting

<u>Kind</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
60% Gelatine.....	2,000 lbs.	\$13.00	\$ 260.00
80% Gelatine.....	1,950 "	15.00	292.50
Total Powder.....	3,950 lbs.	\$13.98	\$ 552.50

<u>Blasting Supplies</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
7" Fuse Lighters.....	500	6.76 M	3.38
Fuse Clips.....	100	2.50 C	2.50
Clover Fuse.....	12,000	5.18 M	62.25
#6 Blasting Caps.....	3,000	12.53 M	37.60
Plain Cordeau Bickford Fuse.....	497 ft.	42.00 M	20.87
#2 Wire Countered C.B. Fuse.....	507	65.00 M	32.96
Total Blasting Supplies.....			\$159.56
Total Powder.....			552.50
Total Cost.....			<u>\$712.06</u>

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Brilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.)

Secondary Blasting (Continued)

Product.....	85,589 tons.
Pounds of Powder per Ton of Ore.....	.046
Cost per Ton for Powder.....	.007
Cost per Ton for Fuse, Caps, etc.....	.001
Cost per Ton all Explosives (Secondary).....	.008
Average Price per Pound for Powder.....	.1398

The increase in the cost of secondary blasting per ton of product, from .004 in 1937 to .008 in 1938 is due to the large amount of work done along the North toe of the East Pit and discussed previously in this report.

COMBINED TOTAL BLASTING COST

<u>Kind</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
Gelamite #2 .....	10,000 lbs.	\$12.25	\$ 1,225.00
60% L.F. Gelatine.....	2,000 "	13.00	260.00
75% L.F. Gelatine.....	3,450 "	14.00	483.00
80% L.F. Gelatine.....	1,950 "	15.00	292.50
90% L.F. Gelatine.....	3,000 "	17.50	525.00
Total Powder.....	20,400 lbs.	\$13.65	\$ 2,785.50
<u>Blasting Supplies</u>			
#2 Wire Countered C.B. Fuse.....	1,523	65.00 M	99.00
Plain Cordeau Bickford Fuse.....	998	42.00 M	41.91
Hot Wire Lighters 7".....	500	6.76 M	3.38
Fuse Clips.....	100	2.50 C	2.50
Clover Fuse.....	12,000	5.18 M	62.25
#6 Blasting Caps.....	3,000	12.53 M	37.60
Total Blasting Supplies.....			\$ 246.64
Total All Explosives.....			\$3,032.14

WEST PIT

	<u>Tons</u>	
Broken Ore remaining Year 1937.....	0	
Blasted 1938.....	45,000	
Total.....	45,000	
Ore Shipped in 1938.....	66,815 tons	21,815 shipped
Estimated Ore on hand, December 31, 1938.....	0	from Overrun

EAST PIT

	<u>Tons</u>
Broken Ore remaining Year 1937.....	51,128
Blasted 1938.....	0
Total.....	51,128
Ore shipped in 1938.....	18,774
Estimated Ore on Hand December 31, 1938.....	32,354

TILDEN MINE  
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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting, & Explosives (Cont.)

2. Blasting (Cont.)

<u>SUMMIT PIT</u>	<u>Tons</u>
Broken Ore Remaining Year 1937.....	7,032
Blasted 1938.....	0
Total.....	7,032
Ore Shipped in 1938.....	0
Estimated Ore on Hand, December 31, 1938.....	7,032

As discussed in an earlier portion of this report, actual broken ore reserves considerably exceed the above figures.

3. Statement of Cost of Drilling and Blasting 45,000 Tons of Ore-West Pit

Net Feet of 9" Holes Drilled - 968' Lost - 0.

<u>Drilling Cost</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost</u> <u>Per Ft.</u>	<u>Cost</u> <u>Per Ton</u>
<u>Operating</u>					
Drilling at Mine	\$ 546.12	\$ 64.78	\$ 610.90	.678	
Sharpening Bits	221.60	77.68	299.28	.332	
Pipe & Fittings	7.50	112.20	119.70	.133	
Rope		9.95	9.95	.010	
Electric Power		101.10	101.10	.112	
Truck & Tractor	176.74	76.84	253.58	.281	
Total Operating	\$ 951.96	\$ 442.55	\$1,394.51	1.546	
<u>Maintenance</u>					
Drill Sharpening Equipt.	48.90	57.15	106.05	.117	
Drill Maintenance	15.66		15.66	.017	
Total Maintenance	\$ 64.56	57.15	121.71	.134	
Total Operating and Maintenance....	\$1,016.52	\$ 499.70	\$1,516.22	1.68	
Cost of 67' drilled in 1937 (67 x 1.892)			126.76		
Grand Total Operating & Maintenance.....			\$1,642.98	1.69	.0365
Depreciation on Churn Drill Equipment .....			417.00 *	.46	
Total Operating, Maintenance & Depreciation			\$2,059.98	2.15	.0457
<u>Primary Blasting Costs</u>	<u>Labor</u>	<u>Supplies</u>			
Labor Loading Holes	78.17		78.17		
Explosives		\$2,320.08	2,320.08		
Other Supplies		5.25	5.25		
Total Blasting Costs...	\$ 78.17	\$2,325.33	\$ 2,403.42		.0534
Grand Total, Operating, Maintenance, Depreciation and Primary Blasting..	\$1,094.69	\$2,825.03	\$ 4,463.48		.0991

\*This item consists of the pro-rated proportion of the depreciation item chargeable to the footage actually blasted.



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7. OPEN PIT  
OPERATIONS (CONT.)

g. Loading Operations

Loading operations at this property were begun on June 8th, two months later than the previous year, and continued intermittently on a single shift basis up to the morning of November 1st on which the final shipment was completed. Production for the year was 85,589 tons which was handled in 40 operating shifts of 8 hours.

No. 31 shovel worked throughout the year in the East Pit with Nos. 29 and 46 in the West Pit. The presence of No. 46 shovel, which was purchased in 1936, not only tends to increase the daily output of the mine but has made possible the proper grading of material from the three loading faces. Without this third shovel, handling the high sulphur material in the West Pit and the lean spots in both pits would be almost impossible.

In general, loading conditions were very good as regards fragmentation, with the exception of some very large chunks which were encountered in the West part of the West Pit. These were produced by the first 9" shot in that vicinity and it is hoped that improvements in our blasting practice will decrease the amount of oversize in the future.

During the year it was necessary to load rather heavily from the rich area in the East portion of the West Pit in order to maintain the analysis of the output as a whole. The West portion of the West Pit now contains a large amount of broken dike which was encountered off and on during the year while in the East Pit very lean material was loaded for some time. This lean material came from the accumulation that was removed from the North toe and was the cause of considerable difficulty until the main pile had been reached by the shovel. As was mentioned previously, No. 31 shovel broke down toward the latter part of the year and was out of commission for the remainder of the season, which made it necessary to complete loading using the two shovels in the West Pit.

In addition to the 1,582 cubic yards of rock and lean material that were removed in November and charged to the stripping account, the following quantities were loaded out during the operating season and charged to current waste pile expense:

<u>Month</u>	<u>Cost</u>	<u>Quantity</u>	<u>Cost Per</u> <u>Cu. Yd.</u>
July	\$142.29	693	
August	68.60	362	
September	57.76	425	
TOTAL.....	\$268.65	1,480	\$0.181

The above is considerably more than was expended during the previous year, due largely to the fact that the amount of dike and lean material in the West portion of the West Pit is steadily increasing. Expenditures for this item will tend to increase as time goes on in order to keep up the grade of the product.

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7. OPEN PIT  
OPERATIONS (CONT.)

g. Loading Operations (Cont.)

A very unusual type of loading was carried on for a few days during June and July when the Pit was not operating on regular production. This consisted of hand-picking and loading a special order of high density stone for Merritt-Chapman & Scott Company, contractors of New York City. This special high density stone which was to be used for crib-filling on a Federal break-water job at Marquette, was obtained from the piles of broken ore in the East Pit and the West portion of the West Pit. The specifications called for material between 5 and 250 pounds, with the smallest dimension of any one piece not less than one-third the largest dimension. The massive blocky material found in the above mentioned areas was suitable for their needs but necessitated hand picking to insure its being within the specifications. The stone was hand-picked from the piles and loaded into one-ton steel boxes which were then skidded by the tractor to the shovel which hoisted them into gondola cars. The price quoted the contractors was \$1.40 a ton F.O.B. the mine, which was based on a cost estimate plus a reasonable profit. As will be seen in the following table, the actual cost was well within the estimate:

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Tonnage</u>	<u>Cost per ton</u>
June - - - - -	\$ 211.78	\$ 45.09	\$ 256.87	367	\$ .70
July - - - - -	358.79	69.44	428.23	689	.622
Total - - -	\$ 570.57	\$114.53	\$ 685.10	1,056	\$ .649

The order called for a total of 1,400 tons, the remainder of which will be loaded and shipped next year.

As was mentioned in the report for 1937, it will soon be necessary to decide upon suitable haulage equipment to transport the ore from the lower bench to the crusher building. Due to the steep grades involved and the relatively short haul, the use of our present locomotives is entirely out of the question. Considerable time has been spent studying this problem and the conclusion reached is that individual motorized haulage units will be the most suitable, probably Diesel operated crawler tractors and wagons.

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8. COST OF  
OPERATING

a. Comparative Mining Costs

	<u>1938</u>	<u>1937</u>	<u>Increase</u>	<u>Decrease</u>
Production	85,589	305,418		219,829
Average Daily Product	2,140	1,996	144	
Tons per man per day	41.86	45.50		3.64
Number of days operating	40	153		113
Number of shifts & hours	40-1-8 hr.	113-1-8 hr. 20-2-8 hr.		113
<u>Cost</u>				
Pit Operating Accounts	.290	.322		.032
Pit General Accounts	.062	.047	.015	
Cost at Mine	.352	.369		.017
Idle & Winter Expense	.357	.083	.274	
Total Cost at Mine	.709	.452	.257	
<u>Depreciation</u>				
Plant & Equipment	.063	.043	.020	
Taxes	.082	.024	.058	
Stripping	.011	.011		0
Grand Total Cost at Mine	.865	.530	.335	
<u>Expense Beyond Mine</u>				
Freight - Rail	.640	.640		0
Lake Freight	.850	.850		0
Cargo Insurance & Analysis	.010	.010		0
Shrinkage	.015	.013	.002	
TOTAL COST LOWER LAKES	2.380	2.043		

b. Detailed Cost Comparison

1. Days and Shifts

In 1938, this property operated a total of 40 shifts compared with 153 in 1937, a decrease of 113 shifts.

2. Production

Production in 1938 was 85,589 tons, a decrease of 219,829 under 1937 when 305,418 tons were shipped. The average daily product was increased from 1,996 tons per shift in 1937 to 2,140 tons, an increase of 144 per shift. This increase was due largely to the fact that repairs to our loading and haulage equipment could be made **between** cargoes when the pit was not operating.

3. Cost of Production

In 1938, the total cost per ton in cars at the mine, before depreciation and taxes, was \$0.709 as compared with \$0.452 in 1937. This increase of \$0.257 was

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8. COST OF OPERATING (CONT.)

b. Detailed Cost Comparison (Cont.)

3. Cost of Production (Cont.)

due entirely to the difference in the winter and idle expense charge for the current year. The charge for winter and idle expense as listed above is \$0.357 as compared with \$0.083 in the previous year, a difference of \$0.274, which more than accounts for the increase in total cost of \$0.257. In other words, the cost at the mine before the charge for winter and idle expense shows a decrease of \$0.017 for the current year. The reason for this large increase is discussed subsequently under winter and Idle Expense.

4. Open Pit Costs

	<u>1938</u>		<u>1937</u>		<u>Increase</u>		<u>Decrease</u>	
Shifts and Hours	40 - 1-8 Hr.		113 - 1-8 Hr.				73-1-8 hr.	
							20-2-8 hr.	
Production Tons	85,589		305,418				219,829	
Average Daily Product	2,140		1,996		144			
Number of Days Worked	40		153				113	
<u>PIT OPERATIONS</u>	<u>1938</u>		<u>1937</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>Direct Ore</u>								
1. Drilling & Blasting.....	\$ 9,358.40	.110	\$ 38,659.85	.127			\$29,301.45	.017
2. Power Shovels Operating.....	2,948.17	.034	10,912.99	.036			7,964.82	.002
3. Power Shovels Maintenance.....	1,039.86	.012	5,020.33	.017			3,980.77	.005
4. Locos. & Cars Operating.....	2,772.68	.032	11,108.38	.036			8,335.70	.004
5. Locos. & Cars Maintenance.....	452.67	.005	986.61	.003		.002	533.94	
6. Track Expense.....	1,068.21	.013	4,706.52	.015			3,638.31	.002
<b>TOTAL DIRECT ORE</b>	<b>\$17,639.99</b>	<b>.206</b>	<b>\$71,394.68</b>	<b>.234</b>			<b>\$53,754.69</b>	<b>.028</b>
<u>General Pit Expense</u>								
8. Water Supply.....	\$ 85.99	.001	861.48	.003			775.49	.002
10. Crushing & Screening.....	3,278.67	.038	19,676.41	.065			16,397.74	.027
11. General Open Pit Expense.....	2,778.58	.033	5,076.48	.016		.017	2,297.90	
12. Open Pit. Supts...	807.49	.009	1,326.68	.004		.005	519.19	
14. Waste Pile Expense	268.65	.003	30.04	.000	\$ 238.61	.003		
15. Exploration								
Drilling.....	3.65	.000	47.73	.000			44.18	
<b>Total General Expense</b>	<b>\$7,223.03</b>	<b>.084</b>	<b>\$27,018.82</b>	<b>.088</b>			<b>\$19,795.79</b>	<b>.004</b>
<b>TOTAL PIT OPERATION</b>	<b>\$24,863.02</b>	<b>.290</b>	<b>\$98,413.50</b>	<b>.322</b>			<b>\$73,550.48</b>	<b>.032</b>

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8. COST OF  
OPERATING (CONT.)

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs (Continued)

<u>GENERAL MINE EXPENSE</u>	<u>1938</u>		<u>1937</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
16. Mining Engineering	\$ 628.26	.007	\$ 1,343.27	.004		.003	\$ 715.01	.
17. Mechanical and Electrical Engineering	172.36	.002	478.72	.002			306.36	.000
18. Analysis & Grading	498.35	.006	2,700.67	.009			2,202.32	.003
19. Safety Department	131.51	.002	241.34	.001		.001	109.83	
20. Local & Gen. Welfare	171.00	.002	471.00	.002			300.00	
21. Special Expense	222.94	.003	573.42	.002		.001	350.48	
22. Ishpeming Office	460.00	.005	1,576.00	.005			1,116.00	
23. Mine Office	1,287.00	.015	2,227.03	.007		.008	940.03	
24. Insurance	214.83	.003	517.54	.002		.001	302.71	
25. Personal Injury	462.76	.005	1,639.77	.005			1,177.01	
26. Social Security Taxes	585.74	.007	1,603.47	.005		.002	1,017.73	
27. Employees Vacation Pay	418.27	.005	1,004.38	.003		.002	586.11	
<b>TOTAL GENERAL MINE EXPENSE</b>	<b>5,253.02</b>	<b>.062</b>	<b>14,376.61</b>	<b>.047</b>		<b>.015</b>	<b>9,123.59</b>	
<b>IDLE &amp; WINTER EXPENSE</b>	<b>30,537.71</b>	<b>.357</b>	<b>25,332.66</b>	<b>.083</b>	<b>\$5,205.05</b>	<b>.274</b>		
<b>COST OF PRODUCTION...</b>	<b>60,653.75</b>	<b>.709</b>	<b>138,122.77</b>	<b>.452</b>		<b>.257</b>	<b>\$77,469.02</b>	
28. Deprn. Plant & Equipmt.	5,394.65	.063	13,048.56	.043		.020	7,653.91	
29. Amortization Stripping	950.13	.011	3,390.15	.011			2,440.02	
30. Taxes	7,050.74	.082	7,184.41	.024		.058	133.67	
<b>COST AT MINE</b>	<b>74,049.27</b>	<b>.865</b>	<b>161,745.89</b>	<b>.530</b>		<b>.335</b>	<b>\$87,696.62</b>	
31. Inventory Adjustment			178.14				178.14	
<b>TOTAL COST AT MINE</b>	<b>\$74,049.27</b>	<b>.865</b>	<b>\$161,924.03</b>	<b>.530</b>		<b>.335</b>	<b>\$87,874.76</b>	

No explanation of cost change is made for the above items unless the increase or decrease is large enough to be significant.

1. Drilling & Blasting

The decrease of .017 per ton is due to two factors, the first of which is that 21,815 tons of ore were shipped from the accumulated overrun in the West Pit without drilling and blasting charges. The second is that out of the 85,539 tons loaded and shipped, only 45,000 were blasted during the current year.

10. Crushing & Screening

The decrease of .027 per ton in this item is due to the fact that during the previous year, several abnormal expenditures were absorbed in the cost of production. These include the installation of a ventilating fan and dust filter, one new set of 42" concaves and two new sets of 10" concaves.

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8. COST OF  
OPERATING (CONT.)

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs (Cont.)

11. General Open Pit Expense

This increase of .017 is due to the decrease in production.

14. Waste Pile Expense

This increase is due to a large amount of rock and lean material encountered in the West Pit.

Idle and Winter Expense

The amount expended during 1938 under this item includes all the miscellaneous repair work that was done after the first of the year. The bulk of this was actually made necessary by work done during 1937 during which the comparatively large tonnage of 305,418 was loaded and shipped. The tonnage for that year, however, carried only that portion of the idle and winter expense that was completed up to December 31st, 1937. A tremendous amount of work remained to be done and was completed to the shipping season in 1938. This fact, together with the abnormally low tonnage produced in 1938, accounts for the large increase in cost per ton.

Idle Expense

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
January - - - - -	\$ 2,495.97	\$ 2,835.79	\$ 5,331.76
February - - - - -	2,770.49	3,364.83	6,135.32
March - - - - -	3,030.73	2,563.51	5,594.24
April - - - - -	2,298.90	3,191.70	5,490.60
May - - - - -	1,652.38	1,083.70	2,736.08
November - - - - -	1,635.35	1,282.40	2,917.75
December - - - - -	1,431.60	900.36	2,331.96
Total - - - - -	\$15,315.42	\$15,222.29	\$30,537.71

28. Depreciation of Plant & Equipment

This increase of \$.020 is due to a change in the depreciation rate.

30. Taxes

The amount actually expended under this item was lower in 1938 than in 1937 but the tremendous decrease in tonnage shipped caused the increase of .058 in cost per ton.

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9. EXPLORATIONS  
AND FUTURE  
EXPLORATIONS

There was no exploration work done at this property during 1938 and none is definitely contemplated for the coming year with the exception of the possibility of exploring the territory lying West of the diorite mass on the west side of the West Pit.

10. TAXES

<u>Tilden Township</u> <u>Tilden Mine</u>	<u>1938</u>		<u>1937</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
N $\frac{1}{2}$ of Sec. 26, 47-27.....	\$270,000	\$5,890.16	\$270,000	\$6,001.83
Personal, Supplies & Equipment	50,000	1,090.77	50,000	1,111.45
Total.....	\$320,000	\$6,980.93	\$320,000	\$7,113.28
Collection Fees.....		69.81		71.13
Total Tilden.....		\$7,050.74		\$7,184.41

11. PERSONAL INJURY

There were no lost time accidents at the Tilden Mine during 1938.

12. NEW CONSTRUCTION  
AND PROPOSED  
NEW CONSTRUCTION

As discussed under the heading of Stripping operations, the new road from the lower bench of the West Pit to the crusher building was practically completed with the exception of surfacing. A connection between the new road and the crusher building was made by the construction of an earth fill approach which is kept in place by three small retaining walls along the West side of the building. One of these walls took the place of the original wing wall which had come loose and had to be removed. The south slope of the new approach was carefully rip-rapped with flat pieces of ore and stone to prevent washing.

A new concrete foundation was placed under the air receiver.

Two small sheds were constructed during the year, one to protect the auxiliary pump and the second to be used for miscellaneous storage.

The only new construction contemplated for 1939 is the possible erection of a suitable storage building and repair shop in the event that new haulage equipment is purchased for the lower bench.

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13. EQUIPMENT  
AND PROPOSED  
NEW EQUIPMENT

a. Shovels and Crushers

The three electric shovels operated throughout the year without any serious breakdowns with the exception of the disabling of No. 31 shovel in the East Pit. This was discussed at some length under the heading of Loading Operations. The amount of work done during the year by these shovels was relatively small with the result that extensive repairs were not necessary at the end of the year.

Only routine repairs and replacements were necessary in the crushing plant due to the low tonnage handled.

One new piece of equipment was purchased for the crusher building. This is a device which is designed to supply clean filtered air for the men working in and around the crusher building while it is in operation. This piece of apparatus, which was installed at a cost of \$470.00, was charged to the Equipment Account A5b.

The ventilating fan and dust filter, installed during 1937, continued to work satisfactorily throughout the year in so far as concerns removing large accumulations of dust from the building. This equipment was installed merely for the purpose of removing and concentrating the dust and does not have the ability to supply proper dust-free air to the men working in and around the crusher. For this reason the above mentioned new equipment was purchased and installed.

b. Drills and Equipment

The new 29-T 9" churn drills, the first of which was purchased in 1936 and the second in 1937, continued to work very satisfactorily. The accessory equipment, which includes an oil burning bit furnace, hardening furnace, quenching tank, electric blowers, etc. all gave complete satisfaction. The bulk of this accessory equipment was purchased in an effort to obtain maximum efficiency from the large size drills, and has subsequently proved very satisfactory.

14. MAINTENANCE  
AND REPAIRS

The usual program of winter repairs was started immediately on November 1st when loading operations were completed and at the end of the year very little remained unfinished.

No. 3 locomotive was shipped to the General Shops for overhauling and the others were repaired at the property. At the end of the year the work on the electric shovels and the crushing plant had been almost completed.

As was mentioned in the discussion of the detailed cost comparison, the 1938 season had to bear a large proportion of the repair expense on equipment which was actually used more in 1937 than in 1938.



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15. POWER

Electric power during 1938 was entirely satisfactory due to the effect of the new mine sub-station and transformers. Practically all of our previous delays and power failures have been eliminated by the installation of this new equipment which transmits power directly to the mine at 33,000 volts instead of 2300 volts via long feeder lines which were too small for the demands of peak loads. A slight increase was made in the charge per kilowatt hour during the current year.

16. WATER SUPPLY

The water supply at the mine was unusually abundant throughout the summer permitting hydraulic washing at any time. This is rather unusual since during a normal summer it is necessary to take advantage of seasonal water run-offs and heavy rains which supplied enough water for hydraulic work.

Secondary drilling with both jackhammers and tripod machines was done with the use of water, pressure on which was obtained by pumping it to storage tanks stationed back of the face of the pit in order to secure static pressure. A small concrete tank was constructed to concentrate the flow of a spring at the mouth of the East Pit. This water was used for both secondary and primary drilling.

18. NATIONALITY  
OF  
EMPLOYEES

	<u>American</u> <u>Born</u>	<u>Foreign</u> <u>Born</u>	<u>Total</u>
English.....	9	4	13
Swedish.....	8	-	8
Finnish.....	7	5	12
Norwegian.....	1	-	1
Irish.....	5	-	5
French-Canadian.....	1	-	1
Total.....	31	9	40

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For purposes of record, we are including the following remarks on the work done on winter and idle repairs for the month of December, 1938:

A small crew of men were engaged in miscellaneous repairs to the crusher buildings, the locomotives and the electric shovels. The record of miscellaneous repair work is listed below:

The eccentrics in both 10" gyratories were inspected and adjusted. The concaves in both the 10" gyratories were removed and new ones installed. The work of building up the frame of the 42" gyratory was completed.

The dippers on the three electric shovels were rivetted and built up with the electric welder.

Two new rack pinions were installed on No. 31 shovel and all loose rivets on the boom were cut out and replaced. Five new caterpillar pads were installed on No. 29 shovel. The work of installing a new shipper shaft bearing was started on No. 46. A new tail stock feed screw was installed on the bit dressing machine and the broken one was welded for a spare.

The tractor was sent to the General Shops for overhauling. The governor and timing gears were repaired and new bushings were installed in the tracks.

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ATHENS MINE  
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1. GENERAL:

The Athens Mine operated on a schedule of four days per week for each employee from January 1st to April 18th, then on a three day per week schedule until June 1st when the working time was reduced to two days per week. The two days per week schedule was in effect for five months or until November 1st, when the working time was increased to three days per week and continued on this schedule for the balance of the year. A staggered working schedule has been in effect all the year under which the mine operated one more day per week than the men worked. It was adopted at first to eliminate the midnight shift and continued on the reduced working time to increase the number of days the mine operated per week. There were only a few men laid off at the Athens Mine when the mine went on the two day per week schedule June 1st, whereas the other C.C.I. Co. mines laid off one full shift of men. The heavy pressure and severe crushing on the 6th level made it advisable to operate the mine as many days as possible per week to speed up mining under the hanging above the areas that were under the heavy pressure.

The reduced operating schedule in effect during most of the year delayed mining designed to relieve the heavy pressure. The product was reduced due to crushing of raises as output from the crushed raise ceased until repairs were completed. Certain sections of the 6th level drifts, as also several raises, have been completely retimbered three times or more during the year. In some areas new, sound, green legs and caps over 20" in diameter have crushed within ten days. Repair crews have worked continuously in these areas and by the time the work was completed it was necessary to start replacing the crushed timber in the same area again. The unusual pressure is caused by concentration of weight on unmined areas due to removal of pressure on surrounding mined areas. In one area the pitch of the hanging wall jasper has increased and is much above the general average. Mining of successive sub levels in this area advances slowly under the new hanging and thus the area continues under the unusual pressure for some time. The only remedy is to mine out one or two sub levels under the hanging but this has proven difficult due to crushing of raises in the area. Progress has, however, been made under the severe handicaps and a definite decrease of pressure on the 6th level is expected some time in 1939.

Shipments from pocket and stockpile were only 98,508 tons in 1938, the smallest since 1932. There have been only five years in the twenty-one years since the mine started shipments in 1918 that shipments have been less than 100,000 tons, these years being 1918, 1919, 1921, 1932 and 1938. Production was 268,050 tons, which has only been exceeded in 1929, 1930, 1936 and 1937.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:

	<u>1938</u>	<u>1937</u>	<u>Decrease</u>
Athens Ore	165,949	253,134	87,185
Mitchell Lease Ore	<u>102,101</u>	<u>189,964</u>	<u>87,863</u>
Total Ore	268,050	443,098	175,048
Rock	<u>8,760</u>	<u>19,884</u>	<u>11,124</u>
Total Hoist	276,810	462,982	186,172

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2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

b. Shipments:

<u>Grade of Ore</u>	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>	<u>Total Last Year</u>
Athens Ore	40,239	33,935	74,174	296,868
Mitchell Lease	24,334		24,334	179,171
Total	64,573	33,935	98,508	476,039
Total Last Year	225,770	250,268	476,039	
Decrease	161,197	216,333	377,531	

Shipments decreased 79.3% in 1938 and were 169,542 tons less than the product for the year.

c. Stockpile Inventories:

<u>Grade of Ore</u>	<u>Dec. 31, 1938</u>	<u>Dec. 31, 1937</u>	<u>Increase</u>
Athens Ore	141,503	49,728	91,775
Mitchell Lease	114,724	36,957	77,767
Total	256,227	86,685	169,542

d. Division of Product by Levels:

The ore hoisted from the various levels was as follows:

	<u>1938</u>		<u>1937</u>	
	<u>Tons</u>	<u>%</u>	<u>Tons</u>	<u>%</u>
6th Level	195,608	73.0	398,952	90.0
7th Level	69,792	26.0	7,276	1.7
8th Level			(1) 36,870	8.3
9th Level	2,650	1.0		
Total	268,050	100.0	443,098	100.0

(1) Ore trammed and hoisted from the 8th level came from development of the 7th level and from mining above the 6th level on the North side of the fault dike. No ore mined in 1937 from the 8th level territory.

e. Production by Months:

The production by months was as follows:

<u>Month</u>	<u>Athens</u>	<u>Mitchell</u>	<u>Total</u>	<u>Rock</u>
January	11,358	12,348	23,706	656
February	17,988	9,085	27,073	1,640
March	21,347	10,817	32,164	1,404
April	15,771	12,599	28,370	912
May	13,703	7,756	21,459	876
June	8,748	5,621	14,369	484
July	8,481	5,376	13,857	244
August	12,924	5,751	18,675	156
September	10,811	5,629	16,440	768
October	11,456	7,193	18,649	544
November	15,453	10,926	26,379	268
December	17,909	9,000	26,909	808
Total	165,949	102,101	268,050	8,760
Total 1937	253,134	189,964	443,098*	19,884
Decrease	87,195	87,863	175,048	11,124

(\*) Includes 7,354 tons overrun from ore hoisted & shipped from stock in 1937.

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2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES: (Cont'd)

f. Ore Statement:

	<u>Athens</u>	<u>Mitchell</u>	<u>Total</u>	<u>Total 1937</u>
On hand Jan. 1, 1938	49,728	36,957	86,685	56,046
Product for Year	165,949	102,101	268,050	443,098*
Prior years stock- pile overrun				63,580
Total	<u>215,677</u>	<u>139,058</u>	<u>354,735</u>	<u>562,724</u>
Shipments	<u>74,174</u>	<u>24,334</u>	<u>98,508</u>	<u>476,039</u>
Balance on Hand	141,503	114,724	256,227	86,685
Decrease in Output	80,582	87,112	167,694	

(\*) Includes 7,354 tons overrun from ore hoisted and shipped from stockpile in 1937.

g. Delays:

The mine was idle January 25th and 26th account of a severe snow storm. The product lost for the four shifts amounted to approximately 2,200 tons.

There was a 4-1/2 hr. delay on December 22nd account of changing the South skip rope. There was no loss of production due to hoisting three hours overtime to make up the time lost.

h. Delays from Lack of Current:

There was one 8-hr. shift delay on January 27th due to lack of current. The loss of product was 570 tons.

3. ANALYSIS:

a. Average Mine Analysis on Output:

<u>Grade</u>	<u>Tons</u>	<u>1938</u>			<u>Tons</u>	<u>1937</u>		
		<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>		<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Athens	165,949	61.11	.134	6.80	253,134	60.50	.138	7.38
Mitchell	102,101	60.86	.131	6.77	189,964	60.59	.134	7.24

b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Iron</u>	<u>Mine</u>		<u>Lake Erie</u>	
		<u>Phos.</u>	<u>Silica</u>	<u>Iron</u>	<u>Moisture</u>
Athens					
Mitchell		None		None	

c. High Sulphur Ore:

No high sulphur ore was encountered in mining during 1938.

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4. ESTIMATE  
OF ORE  
RESERVES:

a. Developed Ore:

Assumption: 12.75 cubic feet equals one ton  
10% deducted for rock  
10% deducted for loss in mining  
% of Bessemer - none

	Athens Lots 1, 7, 10 & 12	Mitchell Lots 8, 9 & 11	Corbit Lease	Total
4th Level and above	259,042	259,606	422,296	940,944
4th Level to 5th Level	733,801	909,245	9,436	1,652,482
6th Level to 7th Level	720,693	169,496		890,189
7th Level to 8th Level	535,933	7,814		543,747
8th Level to 9th Level	395,906			395,906
9th Level to 10th Level	352,588			352,588
Below 10th Level	49,236			49,236
Total Developed Ore Dec. 31, 1938	3,047,199	1,346,161	431,732	4,825,092

The decrease in the estimate in 1938 was 209,509 tons. Deducting this from the product of 268,050 tons shows that 58,541 tons of ore were developed in 1938. The new ore was developed above the 7th and 6th levels, where more ore has been found along the South footwall than was assumed when the estimate was made in 1937.

b. Prospective Ore:

All ore in the mine is developed.

c. Estimated Analysis:

Ore Reserves: Approximate Expected Natural Analysis:

Tons	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Igni.	Moist.
4,825,092	52.90	.118	6.40	.400	2.75	.62	.73	.011	1.40	13.66

Ore in Stock: Average Natural Analysis:

	Tons	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Igni.	Moist.
Athens	141,503	53.38	.117	5.93	.410	2.76	.62	.73	.008	1.32	11.85
Mitch.	114,724	53.18	.114	6.09	.400	2.75	.61	.73	.009	1.32	12.15

5. LABOR  
AND  
WAGES:

a. Comments:

(1) Labor:

The average number of employees was increased in 1938 due to the heavy pressure which made it necessary to employ more men on repair work. Due to closing the Gardner-Mackinaw Mine and transfer of the men to other mines it was possible to get some well trained repair men. There is a good feeling toward the Company by a great majority of the men and all are in a much better frame of mind since the increase in the working time.

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5. LABOR  
AND  
WAGES: (Cont'd)

a. Comments: (Cont'd)

(2) New Construction:

There was no new construction in 1938.

b. Comparative Statement of Wages and Product:

PRODUCT	1938			1937			Increase	Decrease
	1-8	2-8	3-8	1-8	2-8	3-8		
No. Shifts and Hours	268,050			443,098				175,048
<u>AVERAGE NO. MEN WORKING:</u>								
Surface	67			59			8	
Underground	260			224			36	
Total	327			283			44	
<u>AVERAGE WAGES PER DAY:</u>								
Surface	5.48			5.40			.08	
Underground	6.23			6.24				.01
Total	6.06			6.06				
<u>AVERAGE WAGES PER MONTH:</u>								
Surface	85.98			121.17				35.19
Underground	84.24			136.51				52.27
Total	84.60			133.32				48.72
<u>PRODUCT PER MAN PER DAY:</u>								
Surface	21.26			27.92				6.66
Underground	6.35			7.53				1.18
Total	4.89			5.93				1.04
<u>LABOR COST PER TON:</u>								
Surface	.258			.194			.064	
Underground	.980			.828			.152	
Total	1.238			1.022			.216	
<u>AVERAGE PRODUCT MINING:</u>								
Stoping	20.70			19.98			.72	
Ore Development	11.82			12.62				.80
Total	19.98			19.30			.68	
AVERAGE WAGES CONTRACT LABOR	7.06			6.95			.11	
<u>TOTAL NUMBER OF DAYS:</u>								
Surface	12,606			15,872				3,266
Underground	42,202			58,837½				16,635½
Total	54,808			74,709½				19,901½

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5. LABOR  
AND  
WAGES: (Cont'd)

b. Comparative Statement of Wages and Product: (Cont'd)

	<u>1938</u>	<u>1937</u>	<u>Increase</u>	<u>Decrease</u>
<u>AMOUNT FOR LABOR:</u>				
Surface	69,129.99	85,787.85		16,658.56
Underground	262,840.46	366,950.05		104,109.59
Total	331,969.75	452,737.90		120,768.15
<u>AVERAGE WAGES PER MONTH AS PER LABOR STATEMENT LESS CAPTAIN AND CLERKS:</u>				
Surface	82.84	119.34		36.50
Underground	83.65	136.16		52.51
Total	83.49	132.79		49.30

Ten cents (10¢) per hour increase in wages effective March 16, 1937.

Proportion of Surface to Underground Men:

1938 - 1 to 3.88 - 2 8-hr. shifts 6 day and afternoon shifts  
January 1st to February 28.  
2 8-hr. shifts 5 day and afternoon shifts  
February 28 to April 18.  
2 8-hr. shifts 4 day and afternoon shifts  
April 18 to June 1.  
2 8-hr. shifts 3 day and afternoon shifts  
June 1 to November 1.  
2 8-hr. shifts 4 day and afternoon shifts  
November 1 to December 31.

Crews worked on a staggered schedule and men received one shift less than the number of days the mine operated.

1937 - 1 to 3.80 - 2 8-hr. shifts, 5 days and 5 nights Jan. 1, to  
February 15.  
3 8-hr. shifts, 5 days and 5 nights Feb. 15 to  
April 11.  
3 8-hr. shifts, 6 days and 5 nights April 11 to  
October 4.  
3 8-hr. shifts, 5 days and 5 nights October 4 to  
December 6.  
\*2 8-hr. shifts, 6 days and 6 nights December 6 to  
December 31.

(\*) To give each man four shifts per week.



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5. LABOR  
AND  
WAGES: (Cont'd)

c. Operating Schedules - 1938:

Month	Days Mine Worked per Week	Days Per Month	Days Men Worked Per Week	Avg. Shifts Worked Per Month by Each Man
January	6 days & 6 nights	23	4	15
February	6 " 6 "	22	4	16
March	5 " 5 "	23	4	18
April	5 " 5 " to 4/18 4 " 4 " from 4/18	19	3	14
May	4 " 4 "	18	3	14
June	3 " 3 "	13	2	8
July	3 " 3 "	12	2	8
August	3 " 3 "	14	2	9
September	3 " 3 "	12	2	8
October	3 " 3 "	14	2	8
November	4 " 4 "	18	3	13
December	4 " 4 "	17	3	13

Average For Year Mine Operated 17

Average For Year Worked by Each Man 12

6. SURFACE:

a-1. Buildings:

The North side of the shaft house enclosure at the collar of the shaft was enlarged 4 ft. by building a new sheet iron enclosed frame here in 1937. The South side was similarly enlarged in November 1938. This work was done to make more room at the ends of the skip and cage compartments to increase safety for men oiling, greasing and repairing skips and cage. It also makes it easier and safer to change the skips and cage.

The change from square bottom skips to the spherical bottom skips was made in September after each skip dump had been entirely rebuilt. New heavy side plates with new guides for the skip wheels were installed in the dumps and the skip runners shimmed to bring them exactly square with the new dump. This work was very carefully done in order to insure that the skip would go easily in and out of the dump with a minimum of wear on the skip wheels and the angle guides. Steel wearing shoes, which can be replaced when worn out without disturbing the guides, were placed on the guides.

The ordinary repairs to buildings, such as replacement of broken window lights, repair of windows and doors, etc., were made as required during the year.

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6. SURFACE: (Cont'd)

a-2. Docks, Trestles and Pockets:

The old coal dock at the mine was built about 1917 and in 1938 it was so badly rotted that it was decided to rebuild it. The switch track to the West end of the dock came off of the railroad track used for spotting lagging and pole cars. The West 50 ft. of this track beyond the switch to the coal dock has been sinking for the past two years due to the ground settlement on account of the cave to surface 100 ft. beyond the end of the track. Only two coal cars could be switched on the dock at one time prior to the settling of the track and only one this year. It was, therefore, decided to have the switch track to the new coal dock come in at the East end which would permit the spotting of four cars at one time. Timber for the new dock was received in April and after being framed was treated with Chromated Zinc Chloride. It is expected that the treated caps, corbels and stringers will last for the life of the mine. The legs were set on concrete piers to keep them off the ground. The approach to the dock was 66 ft. in length and six bents were required in this section. The dock where the coal is stocked was 132 ft. in length and eleven bents were required. Construction started in May and was completed early in August. The cost for labor and supplies was \$2636.78. The capacity of the new dock is in excess of 1,000 tons of coal.

The decking and nailing strips on the permanent trestle East of the shaft were so badly rotted that the track spikes would not hold and new decking was installed in 1938. The new decking or track ties were 5" X 8" X 32' in size and as they were too long to be treated in the Zinc Chloride tanks they were treated with creosote. When shipments started from the pockets in the fall, the tracks were taken up and new decking and nailing strips installed. Nearly one and one-half carloads of timber were required for this work.

The wood trestle to the stocking ground between the two steel trestles was rebuilt in 1937 and Mitchell ore was stocked here in the winter of 1937-38. It was very difficult to keep the tracks lined up due to shifting of the bents and it was not possible to fill the trestle to ultimate capacity. Conditions became so bad last summer when the frost came out of the stockpile causing it to settle that stocking had to be abandoned. The trestle was partly dismantled later to get stringers and caps for the single-track trestle erected at the end of the Southeast steel trestle. Shipments from stockpile were very small in 1938 and in order to be assured of ample stocking room for Mitchell Lease ore in case of an increase in the working time and possible delay in opening of shipping season in the spring of 1939, six bents on this trestle were repaired and put in condition for stocking. At least 15,000 tons can be stocked here if there is a shortage of room and if absolutely necessary, the area between this stockpile and the one under the Northeast steel trestle can be filled with Mitchell ore by using a scraper hoist to move the ore as it is dumped from the steel trestle.

In order to make room for stocking Athens ore, sixteen bents, averaging 55 ft. in height, were erected at the end of the Southeast steel trestle. This trestle is single track and will stock 80% as much ore as a double track trestle.

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6. SURFACE: (Cont'd)b. Stockpiles:

Shipments from stockpiles in 1938 were only 33,935 tons of Athens ore all of which was loaded from the Southeast steel trestle. The total ore in stock at the end of the year was 256,227 tons without including overrun which explains the necessity for erecting the wood trestles.

c. Timber Treating Plant:

Only a small number of pieces of timber were treated in 1938 due to the reduced operating schedule and the fairly large stock on hand. The cost per foot of timber treated was lower than in 1937. The square timber used in building the new coal dock was treated after being framed. Less treated timber was used at the Athens as the large number used in the previous year was due to opening the 7th level. A carload of treated caps and legs was shipped to the Maas Mine in the fall. The amount on hand at the end of the year was only 483 pieces as compared with 801 in 1937.

The following table gives comparative operating costs of the treating plant for three years:

	<u>Cost Per Ft.</u> <u>1938</u>	<u>Cost Per Ft.</u> <u>1937</u>	<u>Cost Per Ft.</u> <u>1936</u>
Peeling	.0447	.0466	.0398
Treating	.0448	.0501	.0383
Decking	.0047	.0060	.0060
Z Zinc Chloride			.0094
Chromated Zinc Chloride	.0140	.0214	.0240
Heat, Water, Etc.	.0133	.0136	.0118
Total	.1215	.1377	.1293
Maintenance Cost	.0088	.0066	.0069
Grand Total	.1303	.1443	.1362

<u>Year</u>	<u>No. of Pcs. Hardwood</u> <u>Stull Tbr. Treated</u>	<u>No. of Ft. Treated</u>
1938	603	5,285
1937	1,407	12,483
Decrease	804	7,198

	<u>1938</u>	<u>1937</u>	<u>Increase</u>	<u>Decrease</u>
No. of Pieces used at Athens	648	1,358		710
No. of Pieces shipped to Maas and Negaunee Mines	338	66	272	
Total Pcs. used and shipped	986	1,424		438

	<u>Treated Timber on</u> <u>Hand 12/31/38</u>	<u>Peeled Untreated Timber</u> <u>on Hand 12/31/38</u>
9 ft. Pieces	230	None
8 ft. "	253	"
Total	483	"
On Hand 12/31/37	801	265
Decrease	318	265

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6. SURFACE: (Cont'd)

d. Water Purchased for Heating, Cooling, Etc:

The cost of water purchased from the City of Negaunee the last three years was as follows:

	<u>1938</u>		<u>1937</u>		<u>1936</u>	
	Gals.	Amount	Gals.	Amount	Gals.	Amount
1st Quarter	1,945,000	140.31	1,689,000	128.97	288,000	26.69
2nd Quarter	1,846,000	141.29	1,502,000	115.64	603,000	51.78
3rd Quarter	2,257,000	169.64	3,214,000	236.17	879,000	71.45
4th Quarter	1,981,000	149.63	1,799,000	136.23	541,000	45.43
Total	8,029,000	600.87	8,204,000	616.91	2,311,000	195.34
Product - tons	268,050		443,098		310,888	
Cost Per Ton	.002242		.001392		.000628	

The amount of city water used in 1938 was almost equal to the amount used in 1937. The city water is used for spraying in rock drifts and raises, for cleaning cars at shaft loading pockets, for wetting dry raises to prevent rotting of cribbing and for drinking purposes.

e. Grounds:

The grounds at the mine were kept in good condition during the year. The heavy wet snow storm in October broke a great many branches on the Lombardy poplar trees and also damaged the shrubbery. Extra expense was incurred in cleaning the grounds after the storm.

The automobile parking area across the street from the mine grounds was fenced on three sides in 1938. A close barbed wire fence 8 ft. in height was built to prevent access to the parking area except on the street side. This was done to prevent theft of gasoline from employees' cars.

7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking in 1938.

b. Development:

The major portion of the development work during the year was confined to the 7th and 9th levels. Four cross-cuts have now been completed on the 7th level and raises put up to the areas being mined a short distance above the 8th level. The main level haulage drift on the 9th level is nearing completion after which the cross-cuts will be driven. Development work will continue on this level during next year and additional crews will be transferred here as they become available. During the year a small amount of development work was done on the 6th level and subs above.

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7. UNDERGROUND: (Cont'd)

b-1. Development in Rock:

4th Level

About 15 ft. of drifting was done in the fault dike when completing a new airway connection between the 6th and 4th levels.

-415' Sub Level

A portion of the new airway connection between the 6th and 4th levels consisted of 81 ft. of drift in dike on this sub level and 12 ft. of raise in dike to connect to the 4th level.

-515' Sub Level

A portion of the above airway connection driven at this elevation was in the slate footwall for a distance of 65 ft. and 57 ft. of raising in slate was necessary to connect with the -450' sub level.

-540' Sub Level

While mining was in progress on this sub level it was necessary to drift through 15 ft. of dike in order to recover all of the ore.

-550' Sub Level

Early in the year the remaining 28 ft. of the transfer drift, started in 1937, was completed in the jasper footwall. Before this transfer drift was available for use extremely heavy pressure caused it to crush more rapidly than repair crews could maintain it. A transfer raise that was put up from the 6th level to this drift also crushed soon after its completion. On account of the unexpected extremely heavy pressure in this area it was decided to abandon the transfer drift.

-565' Sub Level

While driving a connecting drift for ventilation from No. 734 to No. 732 raise it was necessary to advance through 55 ft. of jasper hanging.

6th Level

There was no drifting or raising in rock on the 6th level in 1938.

-615' Sub Level

Late in the year it was decided to provide another ventilation connection between the 7th and 6th levels. This ventilation connection is being made to provide better ventilation for the mining contracts working above the 6th level in the West half of block 4 South of the fault dike. Late in the year 126 ft. of drift was completed on this sub level from No. 722 raise, in mixed dike and lean ore. The drift is being driven to a point nearly under No. 610 cross-cut on the 6th level from which a raise will be put up to the cross-cut. By means of doors in No. 610 cross-cut the air will be forced up No. 616 raise to the sub levels and return via No. 614 raise.

7th Level

Development work was continued and completed during the year in No. 2 and No. 3 cross-cuts. Two additional raises were cut out in No. 3 cross-cut and completed to the -565' sub level where mining under the hanging in block 3 was in progress late in the year. Two additional raises were also cut out in No. 2 cross-cut and completed to the -540' sub level above the 6th level. Mining from these raises was also in progress late in the year.

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7. UNDERGROUND: (Cont'd)

b-1. Development in Rock: (Cont'd)

No. 2 cross-cut was advanced 153 ft. to the South to the slate footwall. The material encountered while extending this cross-cut was mixed jasper and slate with occasional dike seams.

No. 3 cross-cut was completed early in January after extending it 17 ft. further to the South in the slate footwall.

In nearly all of the raises completed this year in the 7th level cross-cut it was necessary to advance in the jasper and slate footwall for some distance above the level before encountering the ore body.

No. 722 raise in No. 2 cross-cut which was started late in 1937 was completed this year to the -530' sub level. This raise advanced through 44 ft. of lean ore and dike.

No. 724 raise in No. 2 cross-cut was in slate and jasper for a distance of 51 ft. before encountering the ore body.

No. 726 raise in No. 2 cross-cut advanced in jasper and slate and dike for a distance of 65 ft. before encountering the ore body.

No. 734 raise in No. 3 cross-cut was extended for a distance of 9 ft. in the jasper hanging near the -565' sub level to determine if it was up to the true hanging.

No. 732 raise in No. 3 cross-cut was also advanced in the jasper hanging for a distance of 15 ft. above the -565' sub level to determine whether or not the jasper encountered was a seam with ore above it.

During the year several concrete supports were constructed in the main level rock drift and steel rails and "I" beams placed to support the back and sides of a portion of this rock drift where it cuts through the diorite formation. The drift in this formation near the contact of the footwall slate requires this type of support due to the fact that large chunks continue to slab off the back and sides. Gumnite had been applied in this portion of the drift but proved unsuccessful in preventing the ground from slabbing.

The total rock drifting on the 7th level was 170 ft. and the total raising in rock was 184 ft.

9th Level

Work was continued here during the year in advancing the new main level drift which will replace the old drift which had crushed so badly that a new drift was necessary. It had been repaired so many times that the caved area over the drift extended nearly 30 ft. above the level making it impossible to start raises. The new main level drift started on a curve in the diorite formation and advanced for a distance of 154 ft. in diorite before it encountered the ore body.

The grand total footage of rock drifting in 1938 was 709 ft. and rock raising 257 ft.

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7. UNDERGROUND: (Cont'd)

b-1. Development in Rock: (Cont'd)

The following table gives a summary of the total development in rock during 1938:

	<u>Drifting</u>	<u>Raising</u>	<u>Total</u>
4th Level	15'		15'
-415' Sub	81'	12'	93'
-515' Sub	65'	61'	126'
-540' Sub	15'		15'
-550' Sub	28'		28'
-565' Sub	55'		55'
-615' Sub	126'		126'
7th Level	<u>170'</u>	<u>184'</u>	<u>354'</u>
Total	709'	257'	966'
Total 1937			<u>1849'</u>
Decrease			883'

b-2. Development in Ore:

There was a material decrease in the ore development during the year as compared with 1937. Development work is now far enough in advance of mining operations to warrant a smaller development program. During the ensuing year the major part of the ore development will be concentrated on the 9th level where raises will be extended above the 8th level so that mining can be resumed in block 2. The first cross-cut to the Southeast will also be driven and raises extended to the ore body South of the fault dike. The total ore development during the year was 1,498 ft. of drifting and raising as compared with 2,637 ft. in 1937. The greater portion of the development work for the year was on and above the 7th level, the same as in 1937.

-500' Sub Level

No. 611-A transfer raise was put up a distance of 22 ft. in ore above this sub level to the jasper hanging at the -470' sub level elevation. This transfer raise was then cut out on the -485' sub level and mining started directly under the hanging.

-530' Sub Level

A transfer drift was driven at this elevation beyond the mining limit into the West half of block 4. About 53 ft. of ore raise was then put up which encountered the jasper hanging on the -470' sub level and mining was immediately started. The purpose of this transfer drift and raise was to speed up the mining of this ore area directly under the hanging to relieve the heavy crushing of the 6th level. The transfer raise was used for mining two small sub levels under the hanging before it crushed.

-565' Sub Level

Upon completion of No. 734 raise to the jasper hanging at this elevation a drift was advanced Southeast towards the footwall. A transfer raise 25 ft. in length was put up from this drift to the -540' sub level. Before mining operations could be started from the transfer raise, No. 734 raise had crushed to such an extent that it was necessary for repair crews to start recribbing it. The transfer drift on the sub level also crushed and late in the year repair crews were at work retimbering it near No. 734 raise.

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7. UNDERGROUND: (Cont'd)

b-2. Development in Ore: (Cont'd)

-575' Sub Level

A connecting drift 52 ft. in length, for ventilation and traveling, was completed from No. 731 to No. 733 raise.

6th Level

A connecting drift was driven 62 ft. in ore from No. 732 raise upon its completion to this elevation to hole to No. 660 cross-cut. This drift was driven to provide another airway connection from the 7th to 6th level.

No. 610 Raise

Late in the year this raise was completed to the -500' sub level elevation. It is located in No. 610 cross-cut about 30 ft. Northwest of No. 611 raise and was put up to speed the mining directly under the hanging above the 6th level drifts that have been subjected to heavy pressure and constant repair work has been necessary. A total of 101 ft. of raising in ore was required to complete the raise.

The total ore drifting on the 6th level was 62 ft. and the total ore raising 101 ft.

7th Level

All the ore development on the 7th level for the year consisted of ore raising. The ore drifting was completed late in 1937. The following is a summary of the ore raising on the 7th level:

No. 711 raise in No. 1 Cross-cut - Started late in 1937, advanced 55 ft. to the -575' sub level, total height 129 ft. in ore - completed.

No. 722 Raise in No. 2 Cross-cut - Advanced 122 ft. in ore to the -530' sub level elevation. This raise was started late in 1937 and was completed to a height of 44 ft. in footwall jasper and slate at the end of 1937 - completed in 1938.

No. 724 raise in No. 2 cross-cut was started in the footwall slate and jasper and reached the ore body at a height of 51 ft. and extended in ore to the -540' sub level elevation at a height of 109 ft.

No. 726 raise in No. 2 cross-cut was started in footwall slate and jasper and encountered the ore at a height of 67 ft. Completed to the -540' sub level after an advance of 79 ft. in ore.

No. 730 raise in No. 3 cross-cut completed to the -565' sub level. Total height in ore 125 ft.

No. 732 raise in No. 3 cross-cut completed to the -565' sub level. Total height in ore 120 ft.

No. 733 raise in No. 3 cross-cut had reached a height of 71 ft. in ore by the end of 1937 and was completed early in 1938 to the -575' sub level a distance of 41 ft. in ore. Total height 112 ft. in ore.



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7. UNDERGROUND: (Cont'd)

b-2. Development in Ore: (Cont'd)

No. 734 raise in No. 3 cross-cut completed to the -565' sub level. Total height 124 ft. in ore.

The total ore raising above the 7th level in 1938 was 775 ft.

9th Level

Development in ore was continued throughout the year in advancing the new main level ore drift to the Southwest. A total of 381 ft. of ore drifting was completed during the year.

The first raise was cut out in the main level drift and advanced 7 ft. in ore to a total height of 17 ft. above the level. The total ore development on the 9th level was 381 ft. of drifting and 7 ft. of raising.

The following table is a summary of the development in ore in 1938:

	<u>Drifting</u>	<u>Raising</u>	<u>Total</u>
-500' Sub		22'	22'
-530' Sub		53'	53'
-565' Sub		25'	25'
-575' Sub	52'		52'
6th Level	62'	101'	163'
7th Level		775'	775'
9th Level	<u>381'</u>	<u>7'</u>	<u>388'</u>
Total	<u>495'</u>	<u>983'</u>	<u>1478'</u>
Total 1937			<u>2637'</u>
Decrease			<u>1159'</u>

c. Stoping:

(1) General:

The product for 1938 was obtained from mining in block 3 and the West half of block 4 above the 6th level elevation.

Mining in block 3 on the North side of the fault dike has now reached the 6th level elevation. The drifts and raises on the 6th level in this area were abandoned for mining purposes upon completion of the 7th level raises to this elevation in 1937. Mining was also continued from the 7th level raises in the ore area directly South of the fault dike at an elevation of 40 ft. above the 6th level. The South footwall ore area in block 3 has been mined down to an elevation of 50 ft. above the level. Seventh level raises were completed to this area late in the year and most of the ore on this sub level will now be handled through these raises. The 6th level raises in this area now in use will remain available for mining for at least one or two more sub levels after which they will be abandoned.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(1) General: (Cont'd)

In the West half of block 4 North of the fault dike mining has been continued during the year and has now reached an elevation of 140 ft. above the level. South of the fault dike mining has been continued in the West half of block 4 in two separate areas, one directly South of the fault dike and the other along the South footwall. The South footwall ore area, which is the larger of the two, is at present being mined at an elevation of 150 ft. above the level, whereas the area directly South of the fault dike has been mined to an elevation of 90 ft. above the level. A large mass of jasper hanging separates these two areas but at lower elevations they will join. The last of the year mining was in progress by one contract directly under the mass of hanging which separates the two areas.

The ore area North of the fault dike in block 3 was mined on three sub levels during the year by four contracts.

The ore area in block 3 directly South of the fault dike has been mined at one elevation by two contracts throughout the year.

The large ore area on the South footwall in block 3 was mined on three sub levels in 1938 with an average of five contracts working here during the year.

The small ore area on the North side of the fault dike in the West half of block 4 was mined on three sub levels in 1938 by two contracts.

The small ore area directly South of the fault dike in the West half of block 4 was mined on three sub levels in 1938 by an average of three contracts.

The large ore area on the South footwall in the West half of block 4 was mined on three sub levels in 1938 by four contracts.

The mining during 1938 was carried on in six different areas the same as in 1937. These areas were all confined to block 3 and the West half of block 4 and are at different elevations.

Mining was carried on in 1938 on sixteen sub levels which is a material decrease from the number of sub levels worked in 1937 when the mine operated full time with three shifts of men.

(2) Detail of Stoping:

The six different mining areas are reported separately the same as was done in 1936 and 1937.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(2) Detail of Stoping: (Cont'd)

North Side of Fault Dike - West Half of Block 4

Mining has been continued in this area during 1938 by two contracts. Early in the year mining of two pillars on the -430' sub level was completed from No. 607 raise. On the -440' sub level mining was facilitated by the completion of No. 608 raise from the 6th level. This enabled the elimination of No. 607-A transfer raise which was used to mine a small area at this elevation. Mining was completed on the -430' sub level and at the end of the year was well advanced on the -440' sub level where the old transfer drift is located. The width of this ore area seems to be increasing slightly on each succeeding lower sub but not enough to appreciably increase the tonnage. A small amount of water is encountered here which drains from a surface diamond drill hole but it does not cause trouble in mining as this area is comparatively small and the slices are short.

South Side of Fault Dike - West Half of Block 4

Mining has been continued in this ore body since 1936 when the first sub level under the hanging on the -440' sub level was opened. During 1938 operations have been carried on at the -470', -485' and -500' sub level elevations by three contracts. This area persists in being very irregular due to inclusions of the hanging jasper. During the year transfer raise No. 620-A was put up from the -530' sub level to the hanging and mining was started on the -470' sub level. The purpose was to speed up the mining of this area under the hanging to relieve the heavy pressure which caused crushing of the 6th level drifts directly below. Two small areas on the -470' and -485' subs respectively were mined and late in the year mining was in progress on the -500' sub level. Inclusions of jasper are still encountered at this elevation but it is quite evident that they will disappear on the next lower sub level. When mining of this area under the hanging is completed on the -500' sub level the two ore areas, one along the South footwall and the other directly South of the fault dike, will be joined but mining will be carried on at different elevations. There is no doubt that when this is accomplished the heavy crushing on the 6th level will be relieved. Mining directly South of the fault dike during the year was in progress on two sub levels, the -485' and -500' subs. This area increased considerably in size on the -500' sub level and as mentioned above it is anticipated that at lower elevations there will be no separation between the two ore bodies. With an increase in size in this area the slices have consequently increased in length beyond the economical limit. To alleviate this condition another raise was completed late in the year to this area. It provides another raise from which mining of this ore area will be continued during 1939 and will speed up mining under the jasper hanging.

South Side of Fault Dike - Ore Body on South Footwall - West Half of Block 4

Development was started in this ore body in 1935 when the first sub level at the 4th level elevation was opened. Mining has continued in this area since and at the end of the year had reached the elevation of the -440' sub level. During 1938 mining by four contracts were carried on at three different sub levels, the -415', -430' and -440' subs. Early in the year mining was completed on the -415' sub level upon recovery of the last small

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(2) Detail of Stoping: (Cont'd)

remaining pillar. Mining was completed on the -430' sub level and was well under way on the -440' sub level at the end of the year. This ore body has not increased materially in size due to the fact that the jasper hanging which forms the Northwest boundary of the ore limits has practically been vertical on the last two sub levels. Late in the year the slate and jasper footwall was encountered along the East side of the ore area before the mining limit was reached which consequently decreases the size of the ore area considerably. To offset these two features that reduced the size of this ore area, mining to the Southwest on the last two sub levels has extended to the mined area in block 3. Some delay was experienced by the contracts working in this area due to the fact that very little ore can be stored in the raises as the character of the ore is such that it does not run readily but hangs up in these high raises. This makes it necessary to take the ore directly into the motor cars. No. 614 raise, which is one of the raises that serve this area has been repaired several times during the year which has delayed mining in the area tributary to this raise.

South Side of Fault Dike - Ore Body on South Footwall - Block 3

Development of this ore area was started in 1935 at the 4th level elevation. Mining has been continued here and late in 1938 had reached the -540' sub level elevation. During 1938 mining was under way by five contracts on three different sub levels, the -515', -530' and -540' sub levels. Three small pillars on the -515' sub level were mined early in the year. Mining on the -540' sub level was also completed and late in the year mining was under way on the -540' sub level. This ore area has increased considerably in size to the Southwest under the hanging. This made it necessary to establish a mining limit in order that the length of the slices could be maintained within economical working limits. Three 7th level raises have been completed in this area and the major part of the mining here will now be carried on from these raises. The spacing of the 7th level raises is such that a larger area will be mined from each raise. Some of the 6th level raises in this area are still in use but will be abandoned as mining progresses to lower elevations. Incidentally upon completion of the 7th level raises a considerable improvement in the ventilation was evident in this area.

Development of the ore area to the Southwest under the hanging was under way late in the year on the -565' sub level. Three 7th level raises have been completed to this elevation and during 1939 work will be rushed to hasten the development of this area. Mining here and to the West will relieve the pressure on No. 3 cross-cut 7th level.

South Side of Fault Dike - Block 3

Mining was continued here during the year on the -550' sub level by two contracts. Mining on this sub level was started in 1937 and was not completed during the year. This is in accordance with a plan to slow up mining here until mining of the South footwall ore area has reached the same elevation. This plan is necessary due to the 7th level lay out.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(2) Detail of Stoping: (Cont'd)

Mining limits will then be established which will provide economical mining areas for each raise. Mining on this sub level during the year has been carried on from two 7th level raises which were completed early in the year. The old 6th level drift and raises below this area were abandoned upon completion of the 7th level raises. Late in the year another 7th level raise reached this elevation a short distance to the South and will be connected by a drift to the area being mined here.

North Side of Fault Dike - Block 3

Mining in this ore body during the year was carried on by four contracts on three different sub levels. Two remaining pillars on the -565' sub level were recovered early in the year and about 95% of the -575' sub level was mined at the end of the year. Mining in this block has been divided during the year into two separate units, the West and East halves of the blocks. Operations in the West half are being carried on by two contracts at an elevation of one sub level lower than in the East half. Late in the year the West half of the block was about 95% mined on the 6th level elevation whereas in the East half mining on the -575' sub level by two contracts was about 90% completed. Mining in these two areas during the year has been carried on from the 7th level raises which were completed to this elevation early in the year. Mining conditions in this block are very favorable as a good balance has been obtained between the lengths of the slices and the unit areas mined from each of the raises. Ventilation is good, the ore is soft and there is no water to interfere with scraping operations.

All the work done on the -615' sub, 7th and 9th levels has been reported under "Development in Ore and Rock".

d. Timbering:

The cost per ton for timber increased 30% in 1938 due to an increase of 70% in the amount of cribbing timber used and to an increase of 8% in the cost of stull timber. The increase in cost for stull timber is exclusive of cribbing and treated timber. The increase of 70% in the amount of cribbing timber used in spite of a decrease of 20% in the feet of raising was due to cribbing timber used in repair of crushed raises. More stulls were used in repair work than ever before in the history of the mines and the same was true of the cribbing timber. As a result there was an increase of 59% in the feet of timber per ton of ore. No more timber was used per ton of ore mined than in previous years. The feet of lagging per ton of ore increased on account of the extensive repair work.

The cost per ton for timber, lagging, poles and wire netting increased 19.3% in 1938. Ordinarily the timber used in repair work does not have much influence on the cost per ton for timbering as the main cost is labor. The extraordinary amount of repairs required during 1938 in conjunction with the decrease in production made the timber used in repair work an actual factor in the cost. During the year there was an average of fifty-five men repairing, average days worked - 923 per month, average cost per month - \$ 5325.50. The cost per ton for timbering of \$ .562 was the highest in the 21 years the mine has operated which gives a clear picture of the extraordinary pressure and crushing in the 6th level drifts and

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7. UNDERGROUND: (Cont'd)d. Timbering: (Cont'd)

raises during the past year. Mining above the areas under pressure on the 6th level is finally under way and relief from the abnormal conditions will occur in 1939.

Statement of Timber Used:

	<u>Lineal Feet</u>	<u>Avg. Price Per Foot</u>	<u>Amount 1938</u>	<u>Amount 1937</u>
6" to 8" Cribbing	150,484	.0374	5,630.15	3,378.86
8" to 10" Stulls	12,979	.0693	899.65	2,655.72
10" to 12" "	57,527	.1018	5,854.81	8,962.35
12" to 14" "	33,200	.1346	4,469.49	6,089.22
14" to 16" "	9,675	.1682	1,627.67	1,089.11
Treated Timber	<u>5,742</u>	<u>.2879</u>	<u>1,653.20</u>	<u>3,341.96</u>
Total 1938	269,607	.0747	20,134.97	
Total 1937	280,047	.0911		25,517.22
Lagging - 7 ft.	838,510	.7888 C	6,614.14	9,140.77
Poles - 9½ ft.	<u>658,840</u>	<u>1.3744 C</u>	<u>9,055.60</u>	<u>14,572.47</u>
Total 1938	1,497,350	1.0465 C	15,669.74	
Total 1937	2,189,827	1.0829 C		23,713.24
Wire Netting	1,800		<u>115.56</u>	<u>533.20</u>
Grand Total - 1938			35,920.27	
Grand Total - 1937				49,563.66
Product			268,050	443,098
Feet of Timber Per Ton of Ore			1.0058	.6320
" " Lagging " " " "			3.1282	2.5698
" " Poles " " " "			2.4579	2.3722
" " Lagging Per Foot of Timber			3.1101	4.0661
Cost Per Ton for Timber			.0751	.0576
Cost Per Ton for Lagging			.0247	.0206
Cost Per Ton for Poles			.0338	.0329
Cost Per Ton for Wire Netting			.0004	.0012
Total Cost Per Ton			.1340	.1123
Equivalent of Stull Timber to Board Measure			379,823	527,637
Feet of Board Measure Per Ton of Ore			1.4170	1.1907
Lineal Feet of Netting Per Ton of Ore			.0067	.0223
Square " " " " " " "			.0280	.0931

Total Cost for Timber, Lagging, Poles, etc., and Cost Per Ton:

<u>Year</u>	<u>Amount</u>	<u>Cost Per Ton</u>
1938	35,920.27	.1340
1937	49,763.66	.1123
1936	35,719.77	.1149
1935	22,585.11	.1173
1934	19,546.06	.1201
1933	11,372.50	.2401
1932	11,794.89	.1541
1931	28,704.68	.1141
1930	38,001.66	.0985
1929	34,833.71	.1015

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7. UNDERGROUND: (Cont'd)

e. Drifting and Raising:

The following statement gives comparative figures of footage of drifting and raising for the years 1938 and 1937:

Year	<u>Drifting</u>			<u>Raising</u>			<u>Grand Total</u>
	<u>Ore</u>	<u>Rock</u>	<u>Total</u>	<u>Ore</u>	<u>Rock</u>	<u>Total</u>	
1938	495'	709'	1204'	983'	257'	1240'	2444'
1937	1407'	1379'	2786'	1230'	442'	1672'	4458'
Increase							
Decrease	912'	670'	1582'	247'	185'	432'	2014'

Drifting decreased 56.7% due to development of the 7th level having been largely completed in 1937. Development of the 9th level is progressing slowly on a single shift as there is no reason to speed it up. Raising decreased 20% due to less raising on the 6th and 7th levels in 1938.

f. Explosives, Drilling and Blasting:

The cost per pound for powder increased 3.5% in 1938 but the pounds of powder per ton of ore decreased 14%. The cost per ton for all explosives decreased 10.4%. Starting in February Gelamite No. 1 powder was gradually substituted for 50% Gelatin until by the end of March it had entirely replaced the Gelatin powder in use for many years. There are twenty-five more sticks of Gelamite per 100 pounds and the strength per pound is equivalent to 60% Gelatin powder. It has, therefore, about the same breaking strength per stick as the 50% gelatin and on account of more sticks per 100 pounds, goes further. The fumes are less harmful than the fumes from Gelatin powder. No difficulty was encountered in making the change as the men soon became accustomed to the change in the smell of the smoke. The use of Gelamite accounts for the saving in cost for explosives. There has been only one year since 1929 that the cost per ton for all explosives has been under \$ .050. In 1934 the cost was \$ .0488 but since then the length of fuse has been increased and hot wire lighters have come into use with the change from carbide lamps to electric cap lamps. Taking these factors into account it is evident that the cost in 1938 is fully as good as in 1934. The average cost per ton for all explosives in the past nine years was \$ .0532.

Experiments were under way at the end of the year with a cartridge fuse lighter intended for use in raises and in wet places. The cartridges are made up of a paper shell similar to a shotgun shell sealed on one end and a tight rubber cap on the other. There is some black powder at the sealed end of the cartridge. The regular fuses, up to six in number, are punched through the rubber cap up against the bottom of the cartridge. The cartridge is lighted by a pilot fuse that can be varied in length to increase the length of time between lighting and the blast. All the mining contracts are being instructed in the use of the cartridges so that in case they encounter wet ground they can call for them and be familiar with their use. Blasting accidents occasionally occur due to men staying too long to light a wet fuse. The cartridges should eliminate these accidents as the fuses can be kept dry in the cartridges and the miner only has to light four or five fuses instead of thirteen to twenty.

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7. UNDERGROUND: (Cont'd)f. Explosives, Drilling and Blasting: (Cont'd)Statement of Explosives Used: (Ore Development and Stopping)

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1938</u>	<u>Amount 1937</u>
50% Gelatin	21,790	12.25	2,669.28	19,782.51
60% "				69.00
No. 1 Gelamite	65,170	12.25	7,983.52	
Total Powder 1938	86,960	12.25	10,652.60	
Total Powder 1937				19,851.51
Fuse - feet	377,540	4.97	1,876.94	3,642.52
Caps - No. 6	53,925	12.09	651.81	1,045.21
Tamping Bags	17,000	2.00	34.00	48.50
Fuse Lighters	8,500	6.75	57.38	101.12
Connecting Wire	48	.40	19.20	16.00
Shot Firing Cord	500	10.40	5.20	
No. 14 Duplex Lead Wire				8.00
Electric Caps	650	11.85	77.06	
Total Fuse, Etc. 1938			2,721.59	4,860.35
Total Fuse, Etc. 1937				4,860.35
Total All Explosives 1938			13,374.19	
Total All Explosives 1937				24,711.86
Product			268,050	443,098
Pounds of Powder Per Ton of Ore			.3244	.3782
Tons of Ore Per Pound of Powder			3.082	2.643
Cost Per Ton for Powder			.0397	.0448
Cost Per Ton for Fuse, Caps, Etc.			.0102	.0109
Cost Per Ton for All Explosives			.0499	.0557
			(Sinking, Rock Development, Etc.)	
50% Gelatin	1,630	12.25	199.68	141.88
60% Gelatin				2,349.75
No. 1 Gelamite	1,829	12.25	224.06	
Total Powder 1938	3,459	12.25	423.74	
Total Powder 1937				2,491.63
Fuse - feet	14,690	4.97	73.00	261.62
Caps - No. 6	2,075	12.20	25.31	76.58
Electric Caps	250	11.94	29.85	73.90
Shot Firing Cord	500	10.40	5.20	11.40
Connecting Wire				8.00
Total Fuse, Etc. 1938			133.36	
Total Fuse, Etc. 1937				431.50
Total All Explosives 1938			557.10	
Total All Explosives 1937				2,923.13
Total Explosives Used in Mine			13,931.29	27,634.99
Average Price Per Pound for Powder			.1225	.1190



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7. UNDERGROUND: (Cont'd)

g. Mining and Loading

During the year a number of 7th level raises were completed to the subs above the 6th level and replaced the 6th level raises. The 7th level raises were located in accordance with the latest mining practice as regards scraping distances. The area in block 3 North of the fault dike and immediately South of this dike, and also the ore body on the South footwall in Block 3, were all being mined from 7th level raises at the end of 1938. In fact in only the area on each side of the fault dike in the West half of block 4 were the scraping distances quite short due to the small size of the ore body.

Due to the many delays to production on account of crushing of raises which made it necessary to move the miners out to recrib the crushed raises the improvement in mining conditions was not reflected in the cost per ton. However, when crushing decreases and all the contracts can work without interruption for a few months the improvement in mining conditions will be immediately noticeable in the cost of production. In spite of the handicaps in 1938 there was a small increase in the tons per man per day stopping.

Only one scraper hoist was purchased early in 1938, a 20 H.P. electric, which with higher rope speed and more power is ideally adapted to the longer hauls.

In order to determine whether larger size cribbing would prevent, or at least delay for some time, the crushing of raises, in one raise on the 7th level and one on the 6th level, tamarack cribbing 9" to 14" in size was used instead of the regular 6" to 8" size. If at all successful, the extra expense will justify itself as the greatest hindrance to production has been the crushing of the raises.

h. Ventilation:

There was a very noticeable improvement in ventilation in 1938 due to completion of a number of raises from the 7th level. By maintenance of connections to the 6th level there is a strong movement of fresh air through the sub levels in this area. The only area isolated from the airways was on the South footwall in the West half of block 4 above the 6th level. Booster fans were used here to force the air up to the subs. Due to high humidity it was hot on this sub level but tests showed a normal oxygen content in the air. A connection from a 7th level raise which is now being driven below the 6th level will be connected to No. 610 cross-cut by a raise within sixty days. Doors will block the outlet of the fresh air from the 7th level on the 6th level cross-cut and the air will go to the sub level by one raise and back to the 6th level through another raise thus insuring a supply of cool fresh air. If necessary, booster fans on the sub level can force the fresh air into each working place. Considerable expense for airway connections was incurred in 1938 as good ventilation increases efficiency. The cost for ventilation was higher in 1938 due to charging out a 60 H.P. motor which had been installed at the main ventilating fan on the 10th level several years ago, and was not billed to the mine until this year. The cost for current used by the fan was higher due to the low load factor which increased the cost per kilowatt hour.

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7. UNDERGROUND: (Cont'd)

1. Pumping:

The following table gives data on pumping at the Athens and Breitung shafts:

<u>Period</u>	<u>Avg. K.W. Per Day - Athens</u>	<u>K.W.Per Month Breitung Pump</u>	<u>Avg. Gals.Per Min. - Athens</u>	<u>Total Cost Both Mines From Athens Cost Sheet</u>
January	3192	2700	266	\$ 1811.71
February	3242	2300	273	1854.34
March	3280	2000	277	1934.42
April	3717	6300	305	2185.60
May	4267	6000	343	2589.94
June	4210	5000	364	2608.62
July	4141	3900	341	2626.22
August	3726	3600	333	2586.18
September	4190	2600	336	2680.32
October	3797	2200	311	2594.88
November	3663	2200	307	2532.63
December	3777	2400	309	2200.16
Avg. 6 Mos.				
1935	3103	4366	265	2087.93
Avg.Year 1936	2949	3583	255.5	1766.08
Avg.Year 1937	3003	3283	257	1749.12
Avg.Year 1938	3767	3433	314	2350.42
Average Cost in 1934 prior to pumping at the Breitung				2611.79
Saving in 1935 when expense was heavy account of installing pump at Breitung				2600.59
Saving in 1936				10148.52
Saving in 1937				10352.04
Saving in 1938				3135.96
Total saving in four years				26237.11

The water pumped at the Athens increased in 1938, the cost for current was higher due to lower load factor and more labor cost for pumpmen helpers on days mine was idle accounts for the decrease in saving over the cost in years before pumping was started at the Breitung Shaft. The saving in cost was, however, appreciable aside from the great improvement in mining conditions due to less water in the areas being mined. It has been impossible to accurately locate the source of the increase in water. There is a slight increase on the 6th level and also on the 8th level but not sufficient to account for the average increase of 57 gallons per minute throughout the year. There has been a slight extension of the cave on surface which may account for some of the increase that would come in through the mined and caved area in block 1. The increase started in March and persisted throughout the year. It is planned to measure the water coming in on each level several times during 1939 in order to more accurately keep track of any decrease or increase. The Breitung pump operated all year without a delay.

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7. UNDERGROUND: (Cont'd)

1. Pumping: (Cont'd)

The number of gallons pumped at the Athens Mine per minute in each month of the year for the past seven years is given in the following statement:

<u>Month</u>	<u>1938</u>	<u>1937</u>	<u>1936</u>	<u>1935</u>	<u>1934</u>	<u>1933</u>	<u>1932</u>
January	266	244	242	367	318	372	278
February	273	239	244	361*	317	358	286
March	277	237	235	313	313	340	296
April	305	242	238	292	307	326	307
May	343	266	261	290	329	365	312
June	364	269	274	293	361	416	326
July	341	271	284	288	373	422	597
August	333	271	266	278	360	411	542
September	336	263	258	263	356	399	486
October	311	262	261	261	354	356	431
November	307	260	255	253	355	342	402
December	309	263	249	355	355	326	391
Average	314	257	256	292	341	369	338

(\*) Pumping started at the Breitung shaft.

1. Shaft:

The expenditures in this account cover maintenance expense which, however, was above normal due to repairs required to the 10th level loading pocket. The timber in this pocket which had been idle for many years had rotted and with the reopening of the 9th level it became necessary to put the pocket in condition for loading ore and rock. In 1937 expense was very much above normal due to repair of steel sets in connection with installation of new runners in the skip roads in the circular shaft. Only the ordinary repairs to steel sets were necessary in 1938.

Worn skip guides in the square shaft were replaced in 1938 and some of the oak wearing strips on the new guides in the circular shaft. The clearance between the skip and guides is maintained within the limits prescribed by the rules.

8. COST OF OPERATING:

a. Comparative Mining Costs:

<u>PRODUCT</u>	<u>1938</u>	<u>1937</u>	<u>Increase</u>	<u>Decrease</u>
	268,050	443,098		175,048
Underground Costs	1.552	1.268	.284	
Surface Costs	.244	.216	.028	
General Mine Expenses	.282	.185	.097	
Cost of Production	2.078	1.669	.409	
Taxes	.355	.179	.176	
TOTAL COST	2.433	1.848	.585	
No. of Days Operated	205	276		71
No. Shifts & Hours	3 1-8 hr.	22 1-8 hr.		19
	198 2-8 hr.	46 2-8 hr.	152	
	4 3-8 hr.	208 3-8 hr.		204
Avg. Daily Product	1308	1605		297

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8. COST OF OPERATING: (Cont'd)

a. Comparative Mining Costs: (Cont'd)  
COST OF PRODUCTION:

	1938	%	1937	%	Increase
Labor	1.273	61.3	1.035	62.0	.238
Supplies	.805	38.7	.634	38.0	.171
Total	2.078	100.0	1.669	100.0	.409

b. Detailed Cost Comparison:

(1) Days and Shifts:

Year	Days Mine Worked	Shifts & Hours	Men Employed	Total Shifts Worked
1938	205	1, 2 & 3 8-hr.	327	54,808
1937	276	1, 2 & 3 8-hr.	283	74,709½
Increase			44	
Decrease	71			19,901½

(2) Wages:

There was an increase of ten cents (10¢) per hour effective 3/16/37.

(3) Comparison of Production:

Production - 1938	268,050
Production - 1937	443,098
Decrease	175,048

(4) Comparison of Number of Men and Wages:

	No. Men	No. Days	Amount	Rate Per Day
1938	327	54,808	331,969.75	6.06
1937	283	74,709½	452,737.90	6.06
Increase	44			
Decrease		19,901½	120,768.15	

(5) Tons Per Man Per Day:

	1938	1937	Decrease
Surface	21.26	27.92	6.66
Underground	6.35	7.53	1.18
Total	4.89	5.93	1.04

(6) Cost of Production:

	Total	Cost Per Ton
1938	557,044.96	2.078
1937	739,692.43	1.669
Increase		.409
Decrease	182,647.47	

	Labor	%	Supplies	%
1938	341,171.56	61.3	215,873.40	38.7
1937	458,593.94	62.0	281,098.49	38.0
Increase				.7
Decrease	117,422.38	.7	65,225.09	

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8. COST OF OPERATING: (Cont'd)b. Detailed Cost Comparison: (Cont'd)(7) Detail of Accounts:

	1938		1937		<u>Inc. or Dec.</u>	
	2, 3, & 4 1,2, & 3 8-hr.	Per Ton	4, 5, & 6 1,2, & 3 8-hr.	Per Ton	Amount	Per Ton
Days Per Week						
Shifts & Hours						
Production - Tons	268,050		443,098		175,048	
Avg. Daily Product - Tons	1,308		1,605		297	
Number of Days Worked	205		276		71	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>UNDERGROUND COSTS:</u>						
1. Exploring in Mine	37.83		137.59		99.76	
2. Sinking in Shaft						
3. Development in Rock	6043.72	.023	1112.94	.003	4930.78	.019
4. Development in Ore	9730.30	.036	18277.89	.041	8547.59	.005
5. Stopping	108159.31	.403	178550.31	.403	70391.00	
6. Timbering	150633.79	.562	185123.14	.418	34489.35	.144
7. Trimming	43084.38	.161	63356.81	.143	20272.43	.018
8. Ventilation	6121.44	.023	5332.06	.011	789.38	.012
9. Pumping	28205.02	.105	20989.49	.047	7215.53	.058
10. Compressors and Air Pipes	30825.23	.115	37571.16	.085	6745.93	.030
11. Back Filling						
12. Underground Superintendence	11736.19	.044	14427.01	.032	2690.82	.012
13. Cave-in						
14. Maint: Compressors and Power Drills	963.48	.004	1654.00	.004	690.52	
15. Scrapers & Mech. Loaders	8527.22	.032	21332.73	.048	12805.51	.016
16. Electric Tram Equipment	9676.88	.036	12687.39	.029	3010.51	.007
17. Pumping Machinery	2152.90	.008	1607.38	.004	545.52	.004
Total Underground Costs	415897.69	1.552	562159.90	1.268	146262.21	.284
<u>SURFACE COSTS:</u>						
18. Hoisting	24496.75	.091	36507.21	.083	12010.46	.008
19. Stocking Ore	7679.89	.029	9748.15	.022	2068.26	.007
20. Screening-Crushing at Mine						
21. Dry House	6355.26	.024	7194.68	.016	839.42	.008
22. General Surface Expense	6806.65	.025	7214.79	.016	408.14	.009
23. Maint: Hoisting Equipment	5960.79	.022	24509.25	.056	18548.46	.034
24. Shaft	1802.51	.007	4569.20	.010	2766.69	.003
25. Top Tram Equipment	2439.36	.009	3520.07	.008	1080.71	.001
26. Docks, Trestles & Pockets	6486.87	.024	1218.34	.003	5268.53	.021
27. Mine Buildings	3423.23	.013	1006.48	.002	2416.75	.011
Total Surface Costs	65451.31	.244	95448.17	.216	30036.86	.028
<u>GENERAL MINE EXPENSES:</u>						
28. Mining Engineering	2001.94	.008	2175.94	.005	174.00	.003
29. Mechanical & Elec. Engineering	1983.01	.008	1725.48	.004	257.53	.004
30. Analysis and Grading	7268.61	.027	11226.92	.025	3958.31	.002
31. Safety Department	1736.27	.007	1776.81	.004	40.54	.003
32. Telephones and Safety Devices	2500.90	.009	3028.71	.007	527.81	.002
33. Local and General Welfare						
34. Special Expense, Pensions & Allow.	7024.39	.026	3090.70	.007	3933.69	.019
35. Ishpeming Office	8824.79	.033	8892.00	.020	67.21	.013
36. Mine Office	12694.16	.047	12633.24	.028	60.92	.019
37. Insurance	815.93	.003	3783.15	.009	2967.22	.006
38. Personal Injury	11274.73	.042	13757.82	.031	2483.09	.011
39. Social Security Taxes	15612.84	.058	14756.17	.033	856.67	.025
40. Employees Vacation Pay	3338.47	.012	5197.42	.012	1858.95	
Total General Mine Expenses	75076.06	.280	82044.36	.185	6968.32	.095
<u>COST OF PRODUCTION</u>						
41. Taxes	556425.06	2.076	739692.43	1.669	183267.39	.407
Total Cost	95079.02	.355	79398.95	.179	15680.07	.176
	651504.08	2.431	819091.38	1.848	167587.32	.583

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts: (Cont'd)

1. Exploring in Mine:

Covers a proportion of Geological Department expense. Decrease of \$ 99.76 in expense in 1938.

3. Development in Rock:

Total feet of drifting and raising in rock was 830 ft. in 1938 as compared to 330 ft. in 1937. Increase in expense \$ 4930.78 and \$ .019 per ton.

4. Development in Ore:

There were 887 ft. less ore drifting and 252 ft. less raising in 1938. The cost per foot in 1938 was \$ 7.28 as compared to \$ 12.73 in 1937. The decrease in expense was \$ 5847.59 and \$ .005 per ton.

5. Stoping:

The decrease in expense was \$70,391.00 while the cost per ton remained the same. The mine operated 327 less shifts and the production decreased 175,048 tons.

6. Timbering:

The decrease in expense was \$34,489.35 and the cost per ton increased \$ .144. The cost per ton for timber, lagging and poles increased \$ .0217 due to heavy pressure and crushing of sixth level drifts and raises. The number of men on repair work increased which was the main cause of the increase in cost per ton.

7. Tramming:

There was a decrease in production of 175,048 tons due to 327 less shifts worked. The decrease in expense was \$20,272.43 and the cost per ton increased \$ .018.

8. Ventilation:

The increase in expense was \$ 789.38 and cost per ton \$ .012. The increase in expense was due to charging out a second hand 60 H.P. motor transferred from the Cliffs Shaft Mine at a cost of \$595.00 and an increase in the cost for electric power of \$ 110.96.

9. Pumping:

Expense increased \$ 7215.53 and cost per ton \$ .058.

<u>Year</u>	<u>Total Gallons Pumped</u>	<u>Gallons Per Minute</u>
1938	165,316,266	314
1937	135,521,343	257
Increase	29,795,923	57

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts: (Cont'd)

UNDERGROUND COSTS: (Cont'd)

10. Compressors and Air Pipes:

Expenditures decreased \$ 6745.93 and cost per ton increased \$ .030.

Cu. ft. air compressed - 1938	643,005,000
Cu. ft. air compressed - 1937	<u>884,565,000</u>
Decrease	241,560,000

Electric Power cost - 1938	\$ 21,975.66	Cost Per Ton	\$ .082
Electric Power cost - 1937	<u>27,598.91</u>	Cost Per Ton	<u>.062</u>
Decrease	5,623.25	Increase	.020

Less air used account of 327 less shifts worked.

12. Underground Superintendence:

The decrease in expense was \$ 2690.82 and the cost per ton increased \$ .012. The decrease in expense was due to a cut in salaries effective April 16th, 1938 and less shifts per week worked by shift bosses. The bonus paid bosses in 1938, if no accidents occurred, was less due to mine working less days.

14. Compressors and Power Drills:

The expense in 1938 was for repairs to compressors. In 1937 there were six new RB12 drill machines charged out costing \$ 1150.20.

Expenditures decreased \$ 690.52 and the cost per ton remained the same as in 1937.

15. Scrapers and Mechanical Loaders:

There was a decrease in expense of \$12,805.51 and in cost per ton of \$ .016. In 1938 there was only one Ingersoll-Rand 20 H.P. electric scraper hoist purchased and this was charged out on E. & A. No. 799. In 1937 there were four new 15 H.P. and one 20 H.P. Ingersoll-Rand electric scraper hoists and one Sullivan 25 H.P. electric scraper hoist costing \$ 8923.53 and the necessary cables and switches for putting them in service charged to this account. There were also fourteen Holcomb-Westico scrapers bought in 1937 costing \$ 2209.91.

16. Electric Tram Equipment:

	<u>1938</u>	<u>1937</u>	<u>Increase</u>	<u>Decrease</u>
Generators	344.38	212.08	132.30	
Locomotives	3001.44	3498.76		497.32
Wiring	1387.95	1349.23	38.72	
Main Line Tracks	4321.13	5298.32		977.19
Main Line Cars	621.98	2329.00		1707.02

Total expenditures decreased \$ 3010.51 and cost per ton increased \$ .007. Increases in "Generators and Wiring" due to more repairs. Decreased in locomotives and Main Line Tracks due to less repairs. Decrease in Main Line Cars due to charging out three new rocker dump cars in 1937 and none in 1938.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts: (Cont'd)

UNDERGROUND COSTS: (Cont'd)

17. Pumping Machinery:

Expenditures increased \$ 545.52 and cost per ton \$ .004. The increase in expense was due to digging a ditch around caved area on surface to prevent surface water from entering the mine through caved area;; replacing syphon pipes and building new launders underground leading to pump sump; and to charging out \$ 270.00 for pumps transferred from other mines.

SURFACE COSTS:

18. Hoisting:

Ore and rock hoisted during 1938 and 1937 was as follows:

<u>Year</u>	<u>Ore</u>	<u>Rock</u>	<u>Total</u>
1938	268,050	8,760	276,810
1937	443,098	19,884	462,982
Decrease	175,048	11,124	186,172

Expenditures decreased \$ 12,010.46 and cost per ton increased \$ .008. Cost per kilowatt hour higher in 1938 due to unfavorable load factor on account of curtailed operating schedule.

19. Stocking Ore:

Tons Stocked in 1938	203,324
Tons Stocked in 1937	209,974
Decrease	6,650

Expenditures decreased \$ 2068.26 and the cost per ton increased \$ .007. The decrease in expense was due to less ore stocked and a decrease in expense for dismantling and erecting wood stocking trestle.

21. Dry House:

The expense to this account decreased \$ 839.42 due to mine operating less shifts and the cost per ton increased \$ .008 due to smaller product.

22. General Surface Expense:

Expenditures decreased \$ 408.14 due to less working days and the cost per ton increased \$ .009 due to smaller product.



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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts: (Cont'd)

SURFACE COSTS: (Cont'd)

23. Hoisting Equipment:

	<u>1938</u>	<u>1937</u>	<u>Decrease</u>
Electric Hoists	1355.93	2240.29	884.36
Ropes	1528.56	6857.26	5328.70
Skips & Roads	2552.02	14666.72	12114.70
Sheaves	524.28	744.98	220.70

The expenditures decreased \$ 18,548.46 and the cost per ton \$ .034. Decrease in expense to electric hoists due to less repairs to hoists and signal system. In 1938 there was only one 1-3/8" skip rope charged while in 1937 four skip ropes costing \$ 5637.00 and one 1-1/4" cage rope costing \$1219.59 was charged out. The decrease in expenditures to skips and skip roads was due to charging out the following in 1937: A new aluminum double deck cage \$ 2154.78; 3 new spherical bottom skips \$ 2012.08 and replacing skip runners in circular shaft \$ 4066.38. There was less expense to sheaves account of replacing the old sheaves with rubber lined sheaves in 1937.

24. Shaft:

There was a decrease in expenditures of \$ 2766.69 and in cost per ton of \$ .003.

	<u>Steel Sets</u>	<u>Undg. Pockets</u>
1938	558.56	1243.95
1937	2948.59	1620.61
Decrease	2390.03	376.66

The decrease in expense to steel sets was due to reinforcing and rebolting of sets in 1937 when new skip runners were installed. The decrease in expenditures to underground pockets was on account of building transfer pocket on 7th level in 1937.

25. Top Tram Equipment:

The expense to this account decreased \$ 1090.71 while the cost per ton increased \$ .001.

	<u>1938</u>	<u>1937</u>	<u>Increase</u>	<u>Decrease</u>
Engines & Motors	200.82	583.73		382.91
Wire Rope	528.44	787.76		259.32
Sheaves, Rollers, etc.	565.69	482.26	83.43	
Tracks and Cars	1144.41	1676.32		531.91

Decrease in engines and motors due to less repairs. There was less top tram rope charged out in 1938. The increase in expense to sheaves, rollers, etc., was due to replacing more sheaves and repairing signal system. Decrease in expense to tracks and cars due to less repairs and to building new car in 1937.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts: (Cont'd)

SURFACE COSTS: (Cont'd)

26. Docks, Trestles and Pockets:

The increase in expenditures was \$ 5268.53 and in the cost per ton \$ .021. Repairing braces supporting girders on steel trestles \$ 1878.00; rebuilding and repairing skip dump before installing spherical bottom skips \$ 2612.00; replacing decking timbers on steel trestle \$ 780.00. There was also some expense for replacing plates in ore pockets and for repairs to rock trestle.

27. Mine Buildings:

Expenditures increased \$ 2416.75 and the cost per ton \$ .011. The following is a detail of repairs to mine buildings in 1938 and 1937:

<u>Building</u>	<u>Amount</u>	<u>1938</u>	<u>Remarks</u>
Office	16.30	Repairs to porch.	
Shops	6.89	Repairs to doors and windows.	
Shaft House	335.17	Enlarging the enclosure at base of shaft house on the south side.	
Engine House	7.73	Repairs to windows.	
Boiler House	19.21	New doors.	
Dry House	401.15	Painting, repairs to windows and new hot water tank.	
Warehouse	-		
Coal Dock	2636.78	Erecting new dock.	
Total	3423.23		
		<u>1937</u>	
Shops	36.51	Repair steam lines and proportion of new transformer.	
Shaft House	188.80	Enlarging the enclosure at base of shaft house on North side.	
Engine House	328.52	Rewiring and installing modern lighting system.	
Dry House	491.71	Putting in more windows and more lockers and copper piping for showers.	
Warehouse	2.94	Repair doors.	
Total	1006.48		

GENERAL MINE EXPENSES:

28. Mining Engineering:

Covers time and expense of mine engineer and helpers. The expense to this account decreased \$ 174.00 due to cut in salaries. The cost per ton increased \$ .003 due to smaller product.